FINISHING PORTRAIT ENLARGEMENTS BY AIR-BRUSH : IN PASTEL: COLORS AND PENCIL

Practical instruction by an expert finisher, written from a wide and varied experience Notes and News. Illustrations

The Photo Miniature

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—a cable from Ansco Limited and the explanation that followed:

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PORTRAIT By L. J. BUCKLEY

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Finishing Portrait Enlargements

When a photographic portrait is enlarged, two effects result. First, the textures or grain present in the small original, and any retouching or other handwork done upon the original, are magnified and attract undue attention in viewing the enlarged portrait. Second, the amplification or diffusion of the details of the small original necessarily causes the portrait to lose much of its brilliancy and vigor. Some methods of enlarging emphasize these disadvantages more than others. For example: The direct process of enlarging on bromide paper from the original small negative shows these defects plainly. If the enlarged portrait be made in this way from a small negative which itself is a copy from a print, i.e., where the enlargement has to be made from a print, these disadvantages will appear in the maximum degree. If, on the other hand, a transparency is made from the original or "copy" negative, by contact or by reduction in the camera, and from this transparency an enlarged negative of the desired size is made, from which the enlarged portrait is secured by contact printing in the usual way; then, by careful art work on the transparency and on the enlarged negative, the defects mentioned may be considerably modified or remedied. In the intermediate stages of this indirect enlarging method, it is also possible to offset the inevitable weakening of the tone contrasts resulting from the amplifica-

tion of the small original image, by choice of the plate used and other dodges in exposure, development and printing familiar to all professional photographers.

Whatever method of enlarging is used, however, all enlarged portraits need to be put through a finishing process, wherein the roughness, lack or weakness of detail or contrast, or any other defects in the portrait itself or in the background may be remedied, and the portrait made as pleasing to the eye as was the original picture. In this finishing of enlarged portraits, several distinct methods are employed. When photographic portraiture was young, enlargements were generally finished or worked up, as it was termed, in black-and-white with chalks or crayons, or in colors, after the methods of the painter with water-colors or oils. To-day the more speedy and smooth-working air-brush has largely displaced the older and more laborious hand methods, which are now employed chiefly in miniature and high-grade enlarged work on opal, or for the finer, "after finishing" of enlargements which have first been broadly worked with the air-brush.

The Scope of this Book

In the following pages, I propose to deal with the methods generally used at the present time, viz., finishing with the air-brush in black-and-white and colors; with pastel; with ordinary colors and brush; with pastel and brush-work combined; working in semi-tint with water-colors and pastel; and finishing with lead-pencil. Need I point out that the reader must not expect to acquire proficiency in these methods, which would crowd a year's work in any art school, by a mere reading of this little book! The purpose of the different methods, the tools and materials required, the way of working, and the effects they produce,—all these I will set forth as simply as possible, giving only what experience has proved to be practical and commendable. Proficiency in the worker can be gained only by putting what is here explained into practical application, with persistent practice.

Preliminaries

Before entering on the manipulative details of these different methods, mention should be made of the necessary preliminaries which concern all the methods employed.

First, it is usual to finish enlargements upon an easel, inclined at an angle of some seventy-five or more degrees. The worker may either sit or stand before the easel, as he prefers, with the eyes at a considerable distance from the enlargement, which working distance will vary according to the size of the enlargement, say from fifteen inches to arm's length. If one works too close to the enlarged print, he will give too much attention to niggling detail, and the portrait will probably have a dirty and patchy appearance. By working as far as may be convenient from the print, the student will acquire that free, easy touch which gives what is called a broad treatment, as seen in the work of skilled finishers.

The working attitude or position should be easy and unconstrained, for freedom of position gives freedom and latitude of stroke or touch; while a constrained, cramped, or stoop-shouldered position makes for failure and poor work. The left hand should hold the palette (if brush and color-work is in hand) and the mahlstick (Fig. 1), to steady the right hand and keep it from resting on or touching the surface of the portrait.

Tools

A mahlstick is very simply made by taking a round piece of wood, such as a walking cane, about thirty inches long, and padding one end with a ball-shaped tuft of absorbent cotton, so as to form a soft knob at the end. Over

Fig. 1

this knob tie a piece of soft chamois leather and the mahlstick is ready for service. In use, the knobbed end rests upon any unimportant part of the picture on which one is working, and the right hand rests upon or is lightly supported by the stick, which is inclined obliquely across and toward the print. Within easy reach of the right hand, place the tools and conveniences necessary to the method in use, not forgetting a vessel containing clean water for the brushes, and a piece of clean cheese-cloth or other rag for a duster. The air-compressing outfit required in air-brush work is usually placed at the left hand of the worker.

Reference Print

On the easel, to the left of the enlargement and at a convenient height, fix a print from the original negative, or the original itself, if the enlargement was made from a print, so that by constant reference to this original, while working on the enlargement, the vital element of likeness may be preserved, lacking which no amount of finish will make the enlarged portrait a success.

If the enlargement is mounted on cardboard, it should be affixed to a stout drawing-board with pins, so as to present a perfectly flat, rigid surface for working upon. This is essential in air-brush and water-color finishing, as it insures even washes of color, and obviates the tendency of the washes to give patchy, uneven deposits of pigment on the surface of the print.

Air-brush Method

As the air-brush method is that most commonly used today by professional workers, we will take that method first. By the ease and simplicity of its manipulation, the rapidity with which it gives a variety of effects, and the peculiarly smooth and finely finished appearance which it gives in the enlarged portrait, this method has now almost completely displaced all other processes of finishing enlargements.

Air-brushes

The first air-brush was, I believe, the invention of an American, Mr. L. Walkup, and was introduced about 1885-86. In form it was somewhat more cumbersome in the hand than the air-brushes of today, which closely resemble the familiar fountain-pen in shape and convenience of handling. There are several different makes of air-brushes upon the market here and abroad, among which I may mention the Airograph, the Airostyle, the Paasche Air-brush, and the many models made by Wold, of Chicago. As the latter firm is the only one which thought it worth while to reply to my request for detailed information about the different makes, I am obliged here to confine my description and illustrations to the Wold brush. Since all the different makes are very much alike in general principles, and differ only in minor details, the descriptive details which follow will suffice for the time. Needless to say, in taking up air-brush work,

FIG. 2. Wold Air-brush

FIG. 3. Wold Air-brush

The numbers of the parts and attachments of both brushes correspond, with the exception of the handles.

1. Needle.
2. Air cap.
3. Side-cup inlet.
4. Line adjustment screw.
5. Air and color delivery [lever.
6. Air valve.
7. Fountain handle.
8. Screw cap.
9. Hose nipple.
10. Metal side color cup.
11. Protection cap.
12. Spring air-brush holder.

the first thing to do is to familiarize yourself with the makeup and manipulation of the particular brush selected for the work. Every different model has its own peculiar points. Study these and get familiar with your brush before attempting any serious work in finishing an enlargement.

Wold Air-brush

The Wold brushes, as shown in Figs. 2 and 3, are like a fountain-pen in shape, the liquid color being carried in the holder, or in a detachable color-cup; which latter form is the more recent and more convenient, as it carries as much as half an ounce of liquid color. This color is conveyed to a needle with a taper point (Figs. 3, 1), which is released from its bed by operating the finger-piece (Figs. 3, 5) in an upward direction.

How It Works

A current of air entering into the pencil from an air-pump (or other source) by means of a tube connected to the brush at its under side (Fig. 3, 6) is caused to pass to the taper point by depressing the finger-piece, and then by an upward movement, is released from the obstruction to its passage caused by the tapered needle-point, and finds an exit there. The draught caused by the exit of air past the needle draws out the color in the form of an exceedingly fine spray, so fine that when properly manipulated the dots ejected cannot be discerned as such by the naked eye.

By simply pushing the finger-piece or lever down, a current of air only will pass out of the brush, a downward and upward pressure being necessary to insure a color flow in all instruments that are nicely adjusted. The amount of pressure upon this finger-piece will determine the character of the spray and the quantity of color thrown out; with a gentle touch, a fine, light spray is produced, and contrariwise with a heavier one. Another regulating factor in determining the character of the spray is to be found in the amount of air pressure used. The higher pressures naturally vary very much, some working with as low a pressure as five pounds, or less, as read by the pressure gauge; but, as a general rule, it will be found that from ten to fifteen pounds' pressure is required in the majority of cases,

except for fine and delicate work. The pressure required also varies a little according to the density of the color solution used, weak, watery solutions requiring a lower pressure than those of a denser nature.

Preparations for Work

An enlargement which is to be finished with the air-brush must be scrupulously free from all finger- or grease-marks from the hands or elsewhere, as the color positively refuses to "take" over a surface which has been carelessly handled. If by any chance the enlargement is not clean, it should be specially prepared by gently applying pumice powder over the surface by means of a piece of absorbent cotton. But both pumice and any adhering fluff from the cotton must be thoroughly removed afterward, or unsightly marks may result from their presence. Moreover, it is best that the enlargement should be "wet-" instead of "dry"-mounted. That is, mounted with starch or other mounting paste instead of with tissue. Pictures which have been dry-mounted not infrequently leave their support in various parts subjected to the more copious volumes of spray, especially those of large sizes; and, although they can afterward be passed through the heating press again and resecured, there is more difficulty experienced in finishing the picture under such circumstances.

The Colors

For the color, prepare dustless and gritless solutions of artists' lampblack or ivory-black, if the finishing is to be in "black-and-white;" or a mixture of india-ink and Payne's gray or indigo-blue, will be suitable. Again, the brush-makers prepare special water-color pigments for use with the air-brush, which answer equally well. But use only the very best colors. The cheap "students'" colors are often gritty and liable to choke the brush or cause it to spurt, and work unevenly. Prepare solutions of two or three different strengths, and put these into bottles, to insure freedom from dust. Attention to details which eliminate particles of dust from everything to do with the use of the air-brush means freedom from a lot of worry and difficulties in connection with this class of work.

If your picture is to be finished in sepia, you may

possibly have to mix your pigments to match the tone. The colors most likely to be needed in doing so are sepia, warm sepia, vandyke brown, and bister. To enable you to produce cloud-like effects with more positively defined shapes and edges than the mere handling of the brush will accomplish, cut out from a piece of thin zinc, brass or copper cloud templets similar to those shown in Fig. 4. These are used in an ordinary retoucher's pencil-holder, and, the stem being bent at an angle as shown, it is possible to hold them conveniently and parallel to the surface of the picture, when desired.

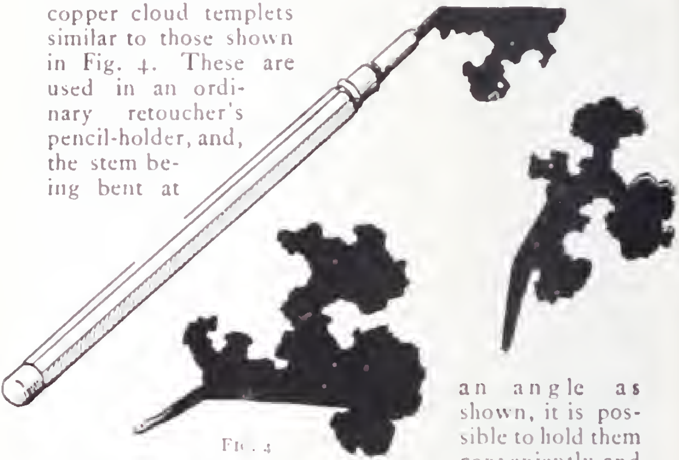


FIG. 4

Before commencing, have by your side some sable brushes, clean water, color ground on a palette of the same tint as that to be used, a duster, a piece of World Finish or other flufless blotting-paper, a mahlstick (Fig. 1), and a piece of plain, stout paper to test the color discharge from time to time, and also to act as a shield when necessary. Connect the air-brush to the tube of the compressed-air chamber, fill it with the suitable solution, and, with the enlargements placed on the easel and illuminated from behind and to the left, you are ready to begin.

Method of Working

In the usual way, many work with an air pressure of twenty to thirty pounds and, as already said, the pressure necessarily differs with the type of brush used. When the air

PORTRAIT By C. C. KOUGH

Note how the white ground and vignetted bust have here been skillfully worked with air-brush and eraser, to heighten the relief effects obtained in the lighting.

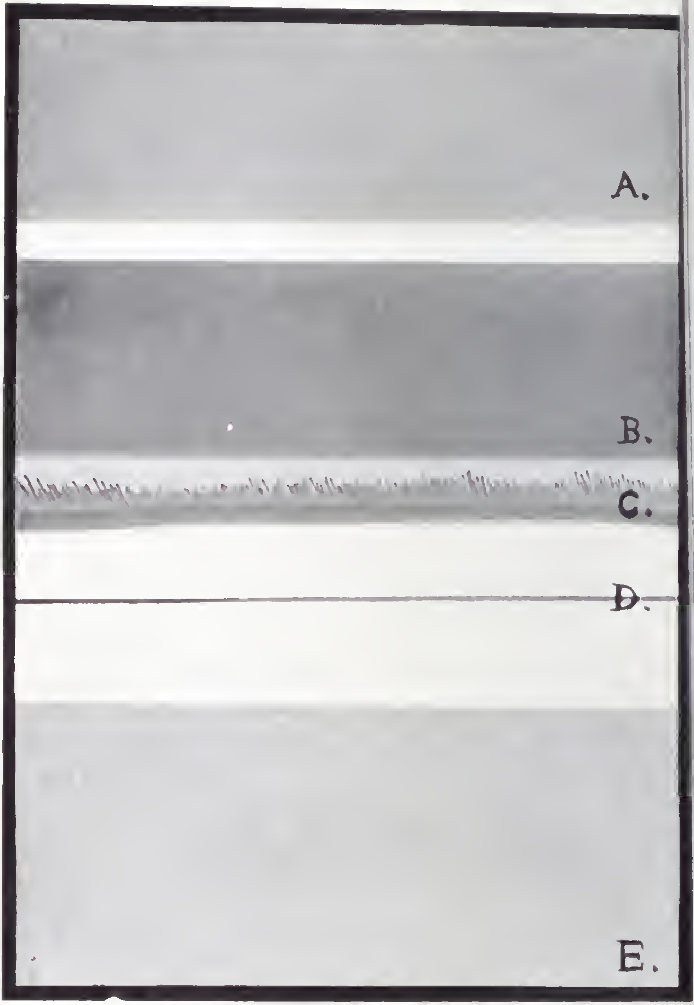


FIG. 5. Examples of the various grain effects produced by the air-brush (see page 13)

pressure is low (five to ten pounds), it produces a coarser deposit of color (Fig. 5 E). If, on the other hand, it is too high, it is much more difficult to control the discharge, which is apt to become unmanageable, and there is a tendency for it to deposit as shown in Fig. 5 B, whereas it should be fine and the dots imperceptible to the naked eye, as seen in Fig. 5 A. The air pressure also has some effect on the making of lines. With a low pressure, quite a fine line can be produced, as at Fig. 5 D; whereas, with a high pressure, the attempt is apt to be like Fig. 5 C.

If you are using a combined fountain- and cup-brush, and intend to use the handle reservoir, see that the tapered plug is secure in the place where the color-cup is usually carried; if, on the other hand, you intend to use the cup, be sure the same plug is placed in the aperture at the top of the handle to prevent leakage.

Spotting: Cleaning Up

Before commencing the air-brush work proper, attend to the spotting, and such cleaning up as is more in keeping with that which is usually called retouching. The spots and retouching in the high lights and half-tones are most expeditiously attended to by means of a finely pointed, hard-grade retoucher's pencil, the use of which will, however, necessitate spraying the parts with water afterward to remove the shine of the pencil and fix the work. This spraying should be done before air-brushing with color. The spots in the deeper tones and shadows must be removed by the ordinary methods of spotting with brush and color. It has been contended that the use of the air-brush obviates the necessity of spotting—at least to a large extent. In a measure it does so, but to the critical eye the spots are apparent, and, if the spotting and retouching are left until after air-brushing, the former is less satisfactory, because it shows more and is more difficult to perform, since the color deposit "lifts" under the application of the sable brush and spotting color.

First Steps

Having, therefore, attended to such spotting and retouching as the machine is incompetent to perform, we may turn our attention to that part of the work in which the air-

brush is to be used, viz., the building up of tone values, which consists of local development of such parts as need strengthening, the insertion of detail and backgrounds, and general attention to modeling. And herein lies the art of "finishing," because it enables us to atone for either the crudities of the original, or the defects in the harmonies of light and shade which may be consequent upon the enlarging. But, if the worker feels more competent to strengthen any such parts with a sable brush, as, for instance, details in the hair or features, this should be accomplished before air-brushing is attempted. And then, first pass a spray of clean water over the parts which have been lead-penciled, allow to dry, and follow on with a color solution of medium density, doing the background perhaps for preference first. We use the word "perhaps" advisedly, because it is impossible to definitely say which is the better part to start on first in all cases; but in most it is best to work the background before strengthening the subject, and also in almost all portrait enlargements the work of modeling the features should be left toward the last, for reasons given later.

Putting in a Background

Suppose now we have a portrait in which we wish to insert a clouded background. The enlargement has probably been vignetted; but it may be "solid,"—that is printed straight from the negative without masking or vignetting. With our "brush" charged with a solution of medium strength, and an air-pressure of probably fifteen pounds, we bring the instrument over the external margin of the "ground" at a distance, say, of two or three inches away; and, holding a clouding templet in the left hand over the same part, but at a distance of from a quarter to one inch away, we gently both raise and depress the finger, and at the same time carefully but nimbly move the brush with an irregular undulating motion, whilst the left hand deftly manipulates the clouding templet. Both instruments are traveling over the ground all the time, sometimes together, sometimes the air-brush alone; sometimes near the "ground," and again farther away. All kinds of motions are used; both quick, slow, circular, elliptic, vertical, horizontal,

undulating, etc.; but, during the whole time the color discharge is open, the instruments are never stationary, except with the templet during the moments in which its use is not required by the brush. The result of this multiple action is to produce a representation of a soft and fleecy cloud effect, without harshness.

The various kinds of clouding sometimes seen in pastel work are rarely attempted, and, beyond making a soft and fleecy appearance, almost the only other concentration of purpose in air-brush clouding is connected with the massing of light and shade, so as to lend to the harmony of the subject. Of this it is impossible to speak here, since each different example needs different treatment and is a law to itself.

Working Near the Face

We have been speaking particularly of the exterior part of the ground, but it often happens that the interior, or those parts beside the features, need attention also; as where a light ground has been used and must be strengthened to throw out the lighted side of the face. Here it is difficult to spray on the color without its spreading over the features or other parts where it is not wanted, unless one leaves an unsightly lighter demarcation between the two parts. The best thing is to make a paper templet for the purpose. Lay carefully over the parts in question a smooth piece of tracing or parchment paper, and using a soft but sharp-pointed pencil, carefully trace the outline of the parts to be protected, and then, removing the same, cut out the stencil with a pair of scissors. The piece of paper is then replaced over the part and in actual contact with it, using great care to see that it covers accurately. You can now safely air-brush over the ground, and the exactitude of your work will determine the amount of sable finishing in the way of spotting (if any) that will be required to patch up the joint. A clever worker can usually do this without producing any unsightly appearance.

Manipulating the Brush

During the clouding, you will not keep the color-discharge of the brush open to the same degree all the time, but will slacken and tighten according to the effect desired. *In all air-brushing, be constantly observant not*

to allow the brush to be stationary even for a fraction of a second, when in actual use. If you do so, the picture will immediately become wet and the color run in tears over the surface. This is also the case if one inadvertently runs the brush over color just deposited, and before it is dry. Keep the brush on the move all the time when the color-valve is open, and constantly remove to fresh parts of the picture, to avoid its becoming too damp. If you are unfortunate enough to cause tears, apply the corner of a piece of fluffless blotting at once, to suck up the moisture, but do not lay the blotter on the enlargement. It is possible to spot-out the little marks left behind by means of a sable brush. You must also remember that for broad effects you hold the brush from three to six inches away from the work; whilst for more defined parts, detail, and smaller effects, you will use it at from an eighth of an inch to two inches distance.

Draperies, Etc.

Having finished the background, you may next turn your attention to the draperies and hair. According to the depth of tone required, you will use a weaker or stronger solution. With the draperies and accessories, it is not so important to attend to the deepest shadows before spraying the lighter parts, and one may be worked in with the other, as a rule. Both draperies and accessories should be handled so as to subdue such parts as unduly intrude into prominence, some detail being perhaps completely buried, and offensive lights softened down to their proper ratio of proportion to the harmony of the whole. It is, of course, possible to insert accessories or alter draperies, if desired. For the former, just lightly sketch out the design to be suggested with a pencil, and fill in with the air-brush spray. For the fine lines, reduce the air-pressure to five or six pounds, and open the color-valve very sparsely. Have in the left hand a sheet of white paper to be held adjacent to the sketch. With the nozzle of the brush almost touching it, and the air and color valves only slightly in action, run the instrument over the paper, and, if the test proves satisfactory (as it will do if air- and color-valves are correctly regulated), slip the brush over the part to be sketched with a quick movement, sketching dexter-

ously and rapidly, and taking refuge over the paper as often as necessary. This is important, since work of this description quickly becomes wet, and it is more convenient than so constantly turning off and on the valves when unnecessary. For the broader parts, a little heavier pressure may be used, but, except in very large pictures, it is seldom wise to go above ten pounds if you are using a delicately responsive brush; as necessarily the parts are small, and therefore the tool has to be used close to the surface of the print. With a heavier pressure the color spreads in tiny parallel streaks, and this must be avoided.

Hair and Broad Shadows

The same remarks are applicable when working the hair, most of which is diffused detail work. Little irritating lights have to be softened, shadows strengthened, and straggling hairs subdued. All this calls for close attention, and close proximity of the brush to the picture. Use the paper shield, and regulate the work according to the needs of the case. Where a shadow broadens out from a point, you can work it by commencing at, say, the point, with the brush close in, and with a sweep to the other end draw the brush farther away from the picture as it travels toward the broader part. If it is to be strengthened evenly, you may open the color-valve as you go farther away from the picture, to compensate for the increased spread of the spray. If the broad end is to be lighter, you will not do so, as, by keeping the color-valve steady whilst removing the brush farther away from the enlargement, you will produce a graduated shade from dark to light; but if, on the other hand, the broad end of the shadow needs to be worked more heavily than the point, you will still raise the brush farther away whilst rising to the breadth of the shadow, but at the same time opening the color- and air-valve in a decided manner by a heavy pressure with the finger. These remarks refer not only to spreading shadows, but form a general principle of air-brush work.

Facial Features

We may now proceed to brush the features, and this, although left almost until the last, is undoubtedly the most difficult part of the work. A single mistake, and the

portrait may be ruined. It would be more convenient to do the finishing of the features first, if it were not for the fact that by doing so we are almost sure to misjudge the depth of work required, and discover, after completing the rest of our task, that it has been finished either too strongly or too flat.

In working with an air-brush on the face of a portrait, we must apply ourselves to the shadow parts first, carrying the deepest tone to the required strength of contrast with the high lights. The air pressure necessary is the lowest that the brush will work with, without depositing a coarse spray. The trigger will only be lightly manipulated, and the paper screen should be constantly at hand. Model as directed above under tapering shadows, except that it may be best to work from the lightest parts toward the deeper ones. With the high lights, consider whether they are too strong. If so, put a light spray over them with one quick little sweep of the brush, holding it an inch or so away from the part, according to its size. The sharpest detail may need finishing with the sable; for, whilst fairly fine lines can be made with the air-brush, sharp edges cannot, without the use of templet or stencil.

Removing Black Spots

Most enlargements have black as well as white spots on them before finishing. This is particularly the case when they are made from copy negatives or badly spotted ones. The spotting with the brush cannot atone for these, and attention thereto is to be left until the last, when

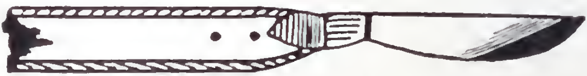


Fig. 6. Retoucher's scalpel.

they are deleted by means of a retoucher's scalpel (Fig. 6). It is useful to do this knifing after brushing, since it often happens that only the color deposit needs to be erased without damaging the gelatine film. It is easily done with a few gentle—very gentle—strokes of the scalpel. If it has been done at first, the spraying may deposit irregularly over the part, since the film must

have been abraded; therefore, for these two reasons be sure and do it at the right time.

After the spots have been removed, any little sable work may be done, and the whites and highest lights just brightened by means of the scalpel, to give it life and sparkle of finish, and then our task is accomplished. We have been working upon a vignetted portrait study, or one with a plain background. Naturally, fancy backgrounds may be worked, too, or backgrounds may be readily inserted. Two great advantages that air-brush work possesses are its softness and the fact that, viewed in any light or from any point of view, the work itself does not show on the surface. This is not so in pastel or the other hand-brush methods.

Air-Brush Color Work

The air-brush lends itself admirably to multi-color work, a fact which seems hardly sufficiently recognized. To finish an enlargement in colors, it is best to provide oneself with a set of color-cups, if the model is one provided with detachable cups. A set of six may be used, and one each will do for, say, *alizarin-crimson*, *aureolin-yellow*, *azure-cobalt*, *neutral tint*, or other selection of colors, one for plain water, and one for any additional colors. But, by judicious mixing, three colors will accomplish all we will desire. Fill the cups with their respective colors, and place in a little stand made by boring round holes in a thick piece of wood with a center-bit or any similar device.

Method of Working Color

Commence with whichever color may be desired. If with a yellow, and you follow with a blue, the first part of the latter spray will be greenish. This may perhaps be utilized, but, if not required, put on the water cup before the blue cup, and pass a little through the brush to wash it out. Do this each time you change the colors, as it will keep them pure to tone and occupy very little time. As is well known, almost any color or shade of color can be made from red, blue and yellow, and the colors given above give good results, although pure French ultramarine may be substituted for the azure-cobalt. For instance, to make a green, lay down a deposit of yellow, and follow with a deposit of blue.

Almost any shade of green may be obtained by using the right proportions of the respective deposits. In the same way, a deposit of red over blue will make anything from lavender to purple. Browns are obtained by mixtures of red, blue and yellow, but these are preferably obtained by using the correct color in the spare cup.

Suitable Colors The following colors are most suitable to use with the air-brush, providing they are of first-class quality:

List 1. Alizarin-scarlet, rose-madder, Antwerp blue, French ultramarine, Prussian blue, burnt sienna, raw sienna, bistre, Vandyke brown, aureolin. *These are both transparent and permanent.*

List 2. Brown-pink, madder-brown, Hooker's green No. 2, pink-madder, yellow-madder, sap-green. *These are transparent, but not so permanent.*

List 3. Vermilion, Venetian red, Indian red, light red, indigo, cadmium-yellow, Naples yellow, yellow ocher, neutral tint, sepia, warm sepia, Chinese white, lampblack, ivory-black, Indian ink, burnt umber, raw umber, terre-verte. *These are permanent, but not transparent.*

When you want to get strength in a shadow, apply neutral tint, and, if the tone is too cold, spray on afterward a little crimson, or yellow, as seems to be required. Blue, on the other hand, will make the tone colder.

Of course, after you have laid down all your colors, and strengthened the parts otherwise, as you would in ordinary monotone work, you will, with the corresponding colors, finish the work by means of the red sable brush, and finally knife up the highest lights. If not an adept with the knife, use Chinese white instead; but knife-work, when skilfully done, is so far superior that it is advisable to master it.

Pointers *The brush spurts:* Either the color solution is impure or particles of grit and dust have found access to the brush. To remedy, clean out the brush and pass clear water through it.

The spray deposits in scattered spots: Here the air pressure is too low. (Fig. 5 E.)

"ROWENA" Copyright 1908 by Knaffl & Bro.

In this portrait the ground and bust have been air-brushed to give the effect of daintiness. It is a good example, too, of the treatment of the hair and contours.

PORTRAIT By C. F. CLARKE

The original of this reproduction, a sepia print, is a clever bit of direct large portraiture by an amateur. If skilfully worked up by the methods herein described, its value would be considerably enhanced. The modeling of the face and neck could be improved, and the plain ground gives desirable variety in tone values.

The spray deposits in parallel streaks: The air pressure was too high, and the brush was held too near the part. (Fig. 5 C.)

Discharge deposits too heavily and with great rapidity: The air pressure was too high and perhaps the color was too dense.

Color runs in large, wet patches: These are caused by not keeping the brush moving, or by working over part before previous deposit has dried.

Air passes from brush, but not color: The brush is clogged. Clean it!

Color forms in globules at the nozzle of brush: Needle needs adjustment.

Spray suddenly becomes coarse: The air supply is exhausted.

Keep the Brush Clean

Always clean the brush after use by passing clear water through it. Never, on any account, leave it uncleaned even for a short time, say of two or three hours. Neglect of this precaution will cause many unnecessary difficulties to appear.

If you blunder with the work and spoil the picture, wash it off immediately with chamois leather and water, mop off surface water, and, after drying, recommence the work. The enlargement will not be spoiled, and you will have profited by your experience. It is needless to add that in sepia enlargements all spotting must be done with the sable, since lead-pencil is unsuitable. The spotting pencils on the market of a sepia shade are quite useless for the purpose.

Finishing in Pastel

The rapid and effective working-up of an enlarged portrait is an operation of considerable commercial importance. If a picture is to please, it may be artistic, but it must be effective, and not lacking in style of finish. Finishing in pastel or crayon has the advantage of being cheap and expeditious, giving great latitude and scope for display of skill, without being so laborious as brush-work. Above all, it is effective, and to the public eye possesses a degree of "finish" equal to either of the other methods.

But there are different ways of doing it, and we suggest the following one as answering the usual requirements

of speed and efficiency, coupled with a facility to make alteration which may subsequently be needed.

The enlargement should be upon rough paper, mounted, and perfectly dry. If it has not been handled carelessly with the fingers, the usual preparatory rub with pumice-powder is unnecessary; otherwise it may be so treated over the background and any other parts where needed, except the flesh portions of the portrait. When pumice is applied over the latter, it is much more difficult to model and clean up unobtrusively.

If it is applied, clean it well off afterward with a duster or pad of cotton, so that the subsequent pastel work may more readily fix itself upon the surface.

Method of Working

Should the subject be a vignetted one, some powdered black pastel ("Série C. Noir. No. 24," procurable from artists' supply stores, is just the very thing) is first applied on a tuft of cotton over the background, and more lightly over the flesh; also on parts of the accessories, as draperies, which need subduing.

Apply in an even tint, yet heavier where greater depth will be required in the finished picture. At this stage the work has a foggy, smudged appearance, and to the tyro appears as if hopelessly spoilt; but this is only quite a passing effect.

A stick of soft pastel should next be used, and with it the heavier shadows can be worked up boldly, softening away with stomp or cotton, as necessary, which must be accomplished so that the work does not appear to be put on, but to be an integral part of the original photograph. Bearing this latter fact in mind, and with the original before you for constant reference and comparison (to insure a perfect retention of character and likeness), a soft stomp, previously charged with pastel on the pastel-pad, should then be used for modeling the hair, draperies, accessories; and later, the features—*i.e.*, the brows, halftones, and shadows of the flesh. Do not be afraid to work somewhat boldly, as errors can be quickly rectified by erasure, and the bolder and broader the work the more effective the finished product will be. Carefully group or mass together the shadows so as to give the picture sufficient body, and subdue unpleasant

portions as desired ; for the worker has great scope for the exercise of his artistic abilities by removing objectionable detail, and inserting the little niceties that go a long way to make a pleasing result.

We can next turn our attention to the background, and, should this be vignetted, we can finish it in various styles according to fancy, the most usual being known as "*Cloud*," "*Cloud-break*," *Electric*, and *Leafy*.

Cloud Ground

The cloud background is an imitation of the regular forms of the clouds of the sky, and for most subjects they should be lighted from the same direction as the photograph. In Rembrandt studies especially we can obtain beautiful results by lighting the clouds from behind, whilst ordinarily lighted portraits will require that the clouds be illuminated from the front. The most convenient forms of effects are known as cumulus, cumulo-stratus, and cirro-cumulo-stratus clouds, the forms of which are illustrated in THE PHOTO-MINIATURE No. 116. The worker can insert either the shadows or the high lights first. The half-tones he has already prepared. The shadows are made by applying pastel and stomp (or, what is better, if less pleasant to the worker, the finger), whilst the high lights are made by removing the tint applied at the commencement of the work with a piece of soft velvet rubber; having, of course, due regard to their correct position, shape, and nature. If the edges appear too harsh, soften away with a piece of cotton very sparsely impregnated with cuttlefish powder. The rubber may also be occasionally slightly charged with the same, when it is desired to produce a more pronounced effect. The beginner must be careful not to work in an aimless fashion. Every touch must assist not only toward producing the cloud-like form, but also help to render a more artistic production and produce a harmonious whole.

Cloud-Break Background

This is a more elementary form of ground, and consists in cloud effect at the marginal region of the vignette only. The tint is left of the plain, even surface it acquired on the first application of the pastel, except perhaps the parts next the image are darkened or lightened a little,

if necessary, to bring out the features more distinctly, or to balance the light and shadow of the subject; whilst the exterior edges of the vignette are clouded with little "breaks of light" by delicate applications of the velvet rubber, subduing, as advisable, with gentle circular touches of the fingers. This form of finishing is very quickly accomplished, and is much in vogue in the finishing department of trade houses, although it is perhaps more frequently done with the air-brush than in pastel where an air-brush is available.

The Electric Ground

This form of background is somewhat similar to the above, except that the lights are more in the form of flashes and oblique streaks than clouds, and the method of finishing, although identical therewith, is somewhat bolder in character and more striking, if less artistic, in effect.

For solid backgrounds of a plain nature, the clouding first described is a desirable and effective method of finishing; but fancy grounds, whether interior or exterior, will be finished according to their nature. If, as frequently happens, a background has been used which is lighted from a different direction from that of the source of light used for the sitter, it is usually possible for the artist to alter it to accord with the latter, an achievement which will be most pleasing to those who do not like the incongruous.

Having finished this class of work on the background, proceed to strengthen the draperies and hair of the portrait, using stomp (or fingers) and pastel for the semi-tones and shadows, and the rubber eraser for the higher lights in the ground.

Working the Face

It will be best to do the face last of all; because, if it is done earlier, and to our liking, it will be found that, when the rest of the subject is brought into relief, the features have become flat and insipid.

After the modeling has been accomplished, cleaning up (as in retouching) of the whole portrait may follow; and it is surprising how little of it remains to be done, as the previous work, whilst accomplishing a different purpose, has also obliterated so many of the inequalities and imperfections. It may be done with gentle touches

of an "H. H." or No. 5 pencil (the little faint shine of the pencil marks will disappear when the picture is glazed) or with the slower brush. If the latter, which *gives the superior effect*, then use a mixture of India ink and Payne's gray as the spotting medium, or Winsor and Newton's process black; India ink alone does not match the bromide black. Finely pointed and extra-hard black crayon in pencil form may also be used for this stage, but is *by far the less* delicate in effect.

The Finer Details

The touch is precisely the same as when retouching a negative, only broader; and remember that, when retouching enlargements, it is essential to sit well back from the easel, in order that uneven and insignificant work may be avoided and breadth obtained. Lastly, when everything else has been attended to (even any dirty marks in the background and elsewhere should have been previously removed with pumiced cotton wool), take a retoucher's scalpel (Fig. 6), and, holding it at almost right angle with the surface of the paper, but really inclining a little to the left, put in the finest high-lights—on the eyes, the bridge of the nose, lace, linen, draperies, etc., using a most delicate touch, so as not to abrade the gelatine film, which should not be done except in order to remove superfluous specks.

It will be seen that Chinese white, or white crayons, are not required; an advantage, as they invariably give a spoiled bluish white appearance to the parts on which they are employed.

Begin with the Shadows

In order to keep the likeness of a portrait, the retouching of a negative should, as we know, be commenced first with the highest lights, and then pass onward to the lesser lights, continuing through the half tones to the shadows, But in positive work the reverse of this rule holds good, and we should therefore commence with the deepest shadows and graduate to the highest lights. It is practically impossible to commence with the highest lights, as in retouching a negative, for, whilst they are the densest parts of a negative, they are the lightest parts in a positive. So for this reason the correct manner of procedure is reversed. Under no

conditions commence working upon the half tones, as it will be next to impossible to render the likeness faithfully if you do so.

The special features of this class of finishing are: (1) The work is totally devoid of hatching, which, to give an equal effect of finish, requires a much longer time for its execution, and (2) the wholesale tinting at the commencement, thus saving an immense amount of touching-out of imperfections; as a clever finisher can easily do forty portraits in a week by the above method, providing the reproductions are from average negatives. In conclusion, no stippling or hatching with the brush must be attempted—not even spotting—on an enlargement to be finished in pastel *until* the latter work has been completely accomplished.

Finishing in Water-Colors

It is manifestly difficult to materially help the student in finishing enlargements by this method, as one really needs to understand water-color painting to become successful therein; but the photographer who is an accomplished retoucher will be able to utilize the hints here given to a greater degree than the one who is not.

Finishing by brush may be classed into three different methods, or a combination thereof; that is, if we except the air-brush, which is really an atomizer rather than a brush. These methods are respectively Wash-work, Hatching, and Stippling.

Wash-Work

In wash-work the water-color is put on in broad washes over the parts we may desire to be strengthened, being careful to obliterate unsightly edge marks caused by the color drying, by inclining the picture to the necessary plane, and toying another brush (which has previously been immersed in water and the excess thereof removed) along the washlines. Care in regulating the proportion of liquid will help in this direction also. These washes are most useful in finishing backgrounds, and beautiful and delicate cloud effects can be produced with them. They are, moreover, serviceable in the better rendering of foregrounds and in strengthening draperies. After the broad semi-tones have been dealt with in this manner, the shadows are deepened if required by more or less broad

touches or deeper washes (which may be applied with various effects either before or after the first is dry); and the high lights may be strengthened either with the scalpel or by increasing the depth of the lower tones, which will, by reason of proportion, intensify the value of the existing higher lights. It is unwise to apply Chinese white for the purpose, as not only has it a "laid-on" appearance, but it sometimes yellows with age and subsequently becomes unsightly.

Hatching

Hatching properly consists of shading by means of lines crossing one another at a more or less acute angle, although the term is applied to the production of lines which do not cross each other. One of these consists of zig-zag lines disjointed at their angles, and running horizontally, obliquely, or vertically across the picture, forming a very effective stroke for running over large backgrounds, especially if they are vignetted. (See Fig. 7, I).

In hatching, the work is principally done by means of lines running in a definite and rhythmical manner. Thus, if a series of lines are commenced at an angle of 60° to the horizon, and another series of 70° or 80°, it will be necessary to keep regularly to these angles over the major portion of the work (although it is possible in some studios to have another set at other angles to them); otherwise the work, when finished, will appear very much like untidy writing which is sloped irregularly and carelessly.

When it is necessary to cover large spaces, the strokes should be light, broad, and well-scattered. If they are over accessories or draperies, they may take the usual direction obliquely downward from right to left. First make a series of short strokes over the part to be covered at an angle, say, of 45°, or other angle with the horizontal or sight-line, and then cross these with short lines running about 55°. The more they are separated from one another, the lighter will be the tone produced; and, conversely, the closer together they run the darker the effect. Various forms of hatching are depicted in Fig. 7.

When hatching over the flesh, it is usually better.to let the direction of the strokes follow the form of the features, using fine, curved, over-lapping strokes. Many

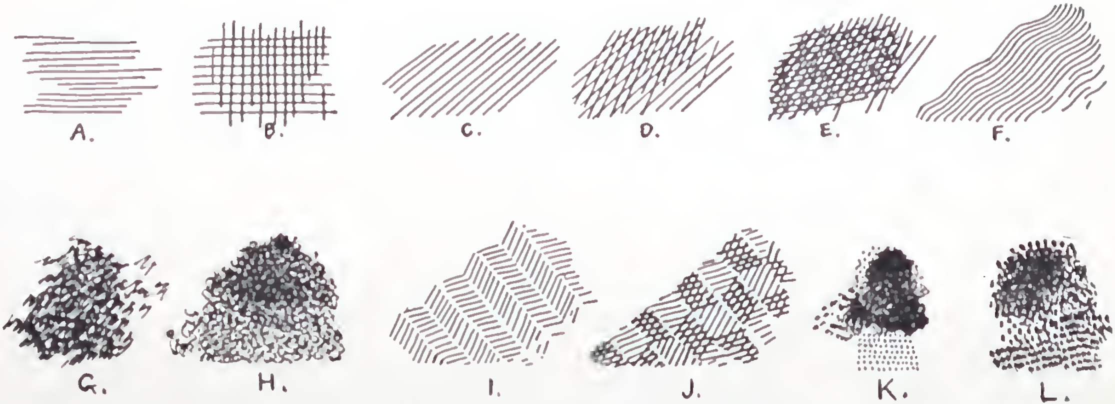


FIG. 7. Various forms of Hatching and Stippling.

A. Horizontal hatching.
B. Square hatching.
C. Oblique hatching.
D. Oblique cross-hatching.
E. Double cross-hatching.
F. Waved hatching.
G. Angular hatching.
H. Curled hatching.
I. Zig-zag hatching.
J. Fancy hatching.
K. Stippling.
L. Long-dot Stippling.

artists prefer to stipple over the face entirely, and there can be no objection to doing so if there is sufficient time; for, as with retouching, stippling is slower, but produces a finer grain. There is also a form of hatch and stipple touch which gives a nice effect. It consists of oblong dots made with touches of the brush-point, combined with a slightly downward movement, the tails of the dots being downward. (See Fig. 7, L.)

Stippling Stippling is working by means of dots or *very small* strokes, and is principally of service in modeling the flesh, and in miniature painting; which is aside of the present subject. It is the slowest way of all finishing methods, but in capable hands produces most beautiful and pearly effects. It is seldom that these three methods are used separately, as one is accessory to the others; and so, generally speaking, one would commence with wash-work, follow with hatching, and finish with stippling, or use one intercurrently with the other. In any case, the enlargement will be cleaned up (with the brush) in a manner similar to that used in retouching negatives.

The Touch Any of the various touches employed for the latter may be made with the brush on the former, the chief points to remember being to have the brush fairly dry, lightly charged with color, and to sit well back from the work; for, unless this latter matter is observed, the work will certainly have a dirty and unfinished appearance. Of course, in working up the hair, brows, etc., no other definite form of strokes will be employed than that necessary for the mere making even or modeling the part; as hatching over these parts usually produces an artificial effect which is not pleasing.

For the development of heavy shadows, the brush may be more fully charged with color, but the necessity of keeping it fairly dry must be fully observed.

After the worker has severally attended to the various parts needing touching, a general survey of the whole will usually discover a few imperfections, owing to the more or less finishing of part by part. With a little practice, however, it is easy to "pull the work together" with a very few strokes. Do not put on a

lot of unnecessary work; not only is it a waste of labor, but the truthfulness of the reproduction will be seriously endangered. It is best to make a habit of endeavoring not to make one unnecessary stroke, experience alone teaching how to make every touch tell.

Only the best red sable brushes should be used, for it is very necessary to obtain a good and springy point. A No. 2 or 3 will be best for stippling, Nos. 4 or 5 for hatching, and Nos. 8 to 10 for washes. These are obtainable at art-supply stores.

Colors

As to colors, these also should be of the best quality. India ink mixed with Payne's gray is suitable for bromide blacks, whilst for sepias "bister" is a most useful shade to use. Ox-gall is used where necessary, to give brilliancy to the shadows, or as a wash (diluted with water) if the color refuses to take on the film surface of the print. Opals, or smooth-surface bromide prints, and carbon enlargements, are rendered especially well by brush methods; whilst rough bromide prints may be finished by washes and broad hatching in a bolder sort of way.

Instead of finishing the picture with monotone color, it is also desirable, at times, to use other tints, or to finish in a representation of natural colors. But the method of working is the same, only we use the different pigments. Apply first the required washes of color, and then proceed to the hatching, stippling, and drawing in detail with the sable brushes.

Pastel and Brush Combined

When it is desired to quickly obtain the effect of brush-work on rough-surface paper, a combination of pastel and brush-work will serve better than the use of the brush alone, inasmuch as it is more expeditious, and in appearance is about the same.

The work is commenced in pastel in the way described on page 24. The tint is laid on and heavy shadows worked—the background being finished in imitation wash-work, i. e. broad masses of pastel.

The lights may be inserted, and the pastel work carried as far as is desired. But inasmuch as it is better done before the brush-work has been applied, it is

wisest to carry it as far as required before resorting to the latter. After the pastel work has been finished, blow off any loose particles, and proceed to brighten the detail with brush and water-color, using India ink and Payne's gray mixed, for blacks; or bister, or other warm sepia brown, for sepias. Wash-work must on no account be attempted, or the picture may be irretrievably ruined. The fluid nature of a wash of color does not blend with the pastel, and, for the same reason, the hatching and stippling worked with the brush must be put on as solid (or as dry) as possible. The delicate nature of the point of a red sable brush enables us to put in detail in a fine and clearly defined manner.

Method of Working

Commence with the draperies or background, and follow on to the hair, finishing the features last of all. In all portrait work observe this rule always.

The modeling and strengthening finished, spot or clean up where necessary, and touch up the highest lights with the knife. Not with the india-rubber, for it removes pastel only, and leaves the brush-work untouched. Some finishers use Chinese or other white to brighten the high lights. If it is used, it must be done very skilfully. It is likely to discolor with age, and generally not so effectual as when done with the scalpel.

Before dismissing the picture as finished, both in this and all other methods of hand-work, sit, or stand well back from the work and examine it critically. Faults unobserved at ordinary working distance may thus be readily noticed, and a few strokes may remedy what would otherwise have been a weakness or imperfection in the finished portrait.

Finishing with Lead-Pencil

For finishing with lead-pencil, the enlargement must be very light in tone and detail, and may be upon either smooth or rough paper, although the latter is more desirable. The tools required consist of a box of electrotyper's plumbago; a stomping pad, some hard and soft india-rubber stomps, and lead-pencils, carefully pointed, and of excellent quality, in grade, viz., H H, B B and B B B. Also a little cuttlefish powder, and a piece of absorbent cotton.

Method of Working

Commence by gently rubbing over the enlargement with the cuttlefish powder, and remove every particle of it with the cotton pad. If you intend using the plumbago, dust it on and apply precisely as you would the pastel described on page 24. As said before, this preliminary base is not absolutely necessary, but it saves a lot of penciling, and thus enables the finishing to be accomplished more quickly; though, as a *pencil drawing* pure and simple, it will detract in part from the quality of the work.

As in this method of finishing we are endeavoring to make a picture by hand-work as nearly as possible, the enlargement having been very *lightly* printed for this purpose, we proceed to sketch in the picture bodily, as one would in pencil drawing, indicating by fair bold touches, only such detail as is desirable, suggesting rather than minutely reproducing every detail. Of course, this does not mean that likeness is to be ignored, but merely that the work is to be sketchy rather than heavy in its particulars.

As to the *modus operandi*, if you understand drawing, you will know what to do; otherwise you must learn it before attempting this class of work. It consists chiefly of hatching and stippling and clearing away where necessary with the india-rubber. Avoid penciling so heavily as to dent the paper with the pencil. If necessary to produce a darker shade, use a softer pencil. Penciling does not take so kindly over the parts covered with the plumbago, nor over penciling already done; therefore make each touch dark enough, without the necessity to re cover with another one. The more distant the hatching lines are from each other, the lighter in effect the tint; whilst those placed closely give a deeper shade, and this may further be intensified with cross-hatching.

Finishing by pencil is most useful when one is desirous of making a reproduction from some old and faded original, which is filled with blemishes, stains and grain of paper. The enlargement itself, being lightly printed, will be minus many of these defects, and the others will be easily covered up by the penciling; and there is before you the original, which will enable

you to supply with the pencil those parts and minutiæ which are lacking. An advantage in this class of finishing is that the picture can be made to lose almost all trace of its photographic origin, if necessary, the actual enlargement being practically not much more than a tracing from which the worker builds up a pencil-sketch that will appear to the ordinary observer to be an original production quite innocent of photography. It is the finished product that he judges. The ways, means and labor to produce it he cares but little about.

Tinting Pencil Work

After the lead-pencil drawing has been completed, it is sometimes possible, especially with portrait studies, to secure very beautiful results by applying washes of water-color of the proper shades and degrees of intensity to the lighter parts of the picture, as the flesh, hair, etc.; coloring more heavily the lips, tinting the checks, and illuminating the eyes with the necessary shade of blue, brown or other tone natural to the individual. Or it may be that the washes are applied first and the pencil-work last, according to the fancy of the worker. In either case the finished effect is similar, and gives a delicate and unusual form of finishing.

Semi-Tint Finishes

To color delicately an enlargement is a matter of time and skill, so that the cost of the finished production is often too great for the ordinary purse. But there is a method of coloring not commonly known, which to the initiated passes under the name of "semi-tint," and to the ordinary black-and-white artist the process is simplicity itself and speedy in actual practice.

It consists in a combination of brush- and pastel-finishing, but of quite a different character to that mentioned under "pastel and brush combined." In fact, a large part of the order of things is reversed. In this method we retouch with lead-pencil first, removing such blemishes as spots and irregularities, that would otherwise appear when the succeeding steps are completed. Following on with wash-work, we lay on washes of transparent color over the respective parts we desire to appear in other hue than the monotone of the enlargement. In doing this, we make no attempt to put in

shadows by neutralizing and deepening the color; but, on the other hand, must not neglect to put the necessary depth of color required, as it is not proper to add it afterward. The eyes, lips, etc., will therefore receive the necessary depth of color; and these are better attended to after the larger washes have dried. In casting the wash over the face, let it concentrate over the cheeks sufficiently, adding a touch of the correct shade of red to them, if the person possesses it. Very little color is needed to accomplish this. It should be located only in the point of the brush and added to the flesh tint already laid on, whilst the latter is still in a fluid condition.

The Colors

Assuming that the reader has read the previous remarks, let us imagine he is about to work up an enlargement in semi-tint. First provide a set of best-quality water-colors (cheap colors are unsuitable).

Speaking generally, the following colors will form a suitable selection: *Reds.*—Alizarin carmine, madder-carmine, burnt carmine, pink-madder. *Browns.*—Vandyke brown, bister, madder-brown, brown-pink, sepia. *Yellows.*—Aureolin, yellow-madder, or gall stone. *Blues.*—French ultramarine, cobalt, Payne's gray. *Greens.*—Sap green, olive-green. I have excluded some beautiful colors from the above list on account of their fugitive nature (most of the above are fairly permanent), and also others which are not transparent. Opaque colors are undesirable for this kind of work.

Method of Working

Now, as to the method of procedure. First, as already said, work out any blemishes in the enlargement, and clean up the grain and retouching with lead-pencil. Color the background first and, if vignetted, some harmonious tint, such as sap or olive-green, cobalt or bister, should be washed over with a large (No. 8) sable brush. In doing this, the top of the enlargement may be slightly raised from the horizontal position; but in making the other washes, it should be level, to prevent the colors running downward, and so giving a deeper tint at their lower extremities. Next, the hair, draperies, and accessories should be tinted, and finally the flesh. If this is tinted first, it is most difficult to judge the correct

depth of color. Bister is a most useful color for brown hair, and very weak washes of the same, with perhaps a faint dash of aureolin or yellow-madder, for the fairer shades; or stronger washes mixed with Payne's gray, or Vandyke for darker brown. Pink-madder will form a useful wash for clear, fair skin, or mixed with burnt carmine, madder-brown, brown-pink, or yellow-madder, for other shades. The tinting must be done more heavily than if the picture is to be finished completely by colors. The cheeks, lips, eyes, jewels, etc., should be colored sufficiently, but no attempt is to be made in shading any of the features.

Finishing in Monochrome

When all the parts needing tinting with color have received attention, and the washes have dried perfectly, *which is most important*, the enlargement is placed upon an easel and finished in black pastel; that is, if the original color was black, or it may be sepia or brown.

We shall not require to make so much wholesale "tinting" with pastel as when finishing by that method alone; but it may be applied more locally according to taste and requirement. Otherwise, we may proceed as already directed; only, as the cleaning-up has previously been accomplished, we shall reach the finished stage the sooner.

It will often be helpful if the tint is placed right over the features at first, removing it from the eyes and highest lights with the eraser, and from the cheeks with a little finely powdered cuttlefish, applied most nicely with a piece of cotton, and removed in the same way.

The finished result should be very effective, and much superior to cheap oil enlargements, especially as the likeness is quite easily retained; whereas, in the latter it is generally lost. In reality, the enlargement appears to be effectively colored, as in ordinary coloring much of the shadow work is done in neutral tones; and this is well represented by the more rapid and velvety finishing in pastel. Of course, it must be borne in mind that the stomp-work materially subdues the tone of the color, and this advantageously, as it allows of a bolder and more rapid treatment resulting in a soft and harmonious finish with abundant vigor.

Air-Brush Finish

If desired, the colored tints may be easily applied with an air-brush, instead of washing them on to the picture with sable brushes; and the work may then be more rapidly proceeded with, as there is no loss of time entailed in waiting for the washes of color to dry. If this method is used, care must be taken to keep the colors pure; and, to accomplish this, it will be necessary to wash out the air-brush after the laying down of each separate tint is finished. The plan recommended in the pages devoted to air-brush work is one of the simplest, and to this the reader is referred.

Fixing Pastel Work

Probably the greatest drawback to finishing enlargements in pastel has been the extreme difficulty of fixing the work so that it does not smudge or easily rub off. The material has such a delicate hold to the paper surface that a mere flick with a duster is often sufficient to completely smear the picture with streaks of pastel powder. Those who have never tried fixing pastels on photographic bases may probably doubt the existence of the difficulty, as there are on the market various "fixatifs" for fixing crayon work. They are, unfortunately, totally unsuitable for photographic work, as they dry over a gelatine film with a more or less patchy and glossy surface, totally ruining the work. Again, a fixative which will do tolerably well for a rough paper is useless for a smooth one. I have tried diluting the fixatifs on the market, so as to make them dry flatter; but the result is unsatisfactory. After making extensive experiments with various gums, gelatines, etc., and many dilutents, I have settled on a formula which gives very good results on both rough and smooth papers, and can be safely used without fear of spoiling either the enlargement or its mount; the latter being quite as essential as the former, for it is impossible to cover it so that the fixative will not travel onto it. When perfectly dry, it will stand dusting and practically as rough usage as a water-colored enlargement would do.

In order that the reader may understand the difficulties in the way of making a perfect fixative, it may be as well to point out the necessity that the preparation used should not discolor the enlargement or its mount; should

not dry glossy, white, or patchy; should not form tears or spots; should dry quickly, and not carry off the powdered pastel—or, in other words, remove the work.

Of the most suitable bases for making a fixative may be mentioned mastic and celluloid. The former is more useful than other resins or gums, on account of its greater hardness combined with elasticity. Mastic is partly soluble in alcohol, methylated spirit, or ether, but a tenth part of it (which gives it its elasticity), called masticine, is insoluble therein. I find that amyl acetate dissolves the mastic acid, and also has some effect on the masticine; for a clear and bright solution can be effected with but little precipitation, The two, therefore, used together, make a fairly passable fixative, but disposed to deposit in fine, stringy lines and rings; whilst, if either alcohol or methylated spirit is used instead of amyl acetate, whitish crape-like markings are apt to make their appearance, as also they do if a fixative composed of celluloid, alcohol, and ether is used, unless it is made so strong in celluloid as to cause it to dry glossy. Celluloid and amyl acetate would do admirably but for its disposition to remove portions of the pastel-work; but by combining them with mastic we get a satisfactory result.

A Good Fixative

The formula I have worked out as wholly satisfactory is as follows: Solution No. 1: Take mastic 24 grains, dissolve in amyl acetate 3 ounces, by agitation, and allow to stand some hours before use. Next, dissolve 7 grains of celluloid in 3 ounces of amyl acetate, by continual agitation, as solution No. 2. When No. 1 solution is clear, add No. 2 to it and keep for use in a short-necked and tightly corked bottle.

Applying the Fixative

Procure from an art-supply store a spray diffuser, which is composed of two little pipes, which when opened out for use are at right-angles to each other. Place the picture to be fixed in a vertical position, and then insert the end of one of the pipes (the finest one, and made of metal) in the bottle of fixative. Put the other, and larger, tube to the mouth (which must be emptied of saliva and the lips dried), and blow through it in the direction of the enlargement, which should be about fifteen inches

away. The fluid will be brought up through the smaller pipe and sprayed onto it. Direct the spray to upper edges of the photograph, and then work across and down *as rapidly as possible, and using only a very small quantity of fluid;* otherwise it will run in unsightly tears down the mount.

When covered, dry the enlargement by waving in the air, and also rotate it so that the fixative does not dry in curves. If it does, it will leave unsightly glossy lines; and although these may be removed by dabbing (without rubbing), using cotton moistened with amyl acetate for the purpose, yet it is far better to avoid having to do so. When surface-dry, it should be allowed to stand by for an hour or so, to harden. Then it can be subjected to reasonable handling without risk of damage and, if properly done, it will be found that the fixative has dried in a way so that it is impossible to tell whether the picture has been fixed or not.

A better instrument than the usual artists' spraying diffuser is an *atomizer* (not a perfume spray) obtainable at any first-class druggist's. This will more finely divide the spray, and also help to obviate the tendency for the fixative to dry in curves or glossy lines.

Pencil-drawing enlargements may be fixed in the same way; or, by merely holding over steam, will fix them sufficiently for most purposes.

ARTHUR WHITING.

A PLEASANT EVENING By GEORGE F. BROWER

News and Comment

One of the most lovable of men, a veteran in American photography, whose long life and generous heart were largely devoted to its growth and well-being, passed to his reward in the death of Gustav Cramer, at St. Louis, July 16.

Mr. Cramer was born in Eschwege, Germany, in 1838, and came to America on reaching his majority, entering at once into the service of John A. Scholten, who was then the principal portraitist in St. Louis. When the Civil War broke out, young Cramer joined the Federal Army and took part in the battle of Carthage, Mo. After the war he resumed the practice of his profession in partnership with Prof. Gross. In 1880, when the dry-plate process was introduced in photography, Mr. Cramer associated himself with Mr. Norden, in the manufacture of gelatine dry-plates, the firm later becoming the G. Cramer Dry-Plate Co., of which Mr. Cramer was president until his death. In this business he quickly won such success that the name and fame of "Cramer Plates" are household words among American photographers. More than this, by his wide friendliness and fraternal goodwill, he won the personal affection of thousands in his association with the activities of the profession, and for many years past he has been familiarly known and loved as "Papa" Cramer. May the earth rest lightly on him.

The all-absorbing topic just now is this terrible war which threatens to engulf European civilization. Whatever the outcome, its progress is bound to have a disturbing effect on the photographic industry in America, at least for a time, since we are dependent on Europe for so much of the apparatus and raw material employed

in photography. When, however, the first "scare" passes, and our American manufacturers realize the opportunity which the shutting off of European competition gives them for the exploitation of American goods, doubtless better and more prosperous days will come. There is no reason why we should not produce in America everything necessary and desirable in photographic work. Let us hope that our manufacturers will show themselves equal to their opportunity.

The new catalog of Photographic Lenses and Shutters, published by the Bausch & Lomb Optical Co., has just come to our desk, and is one of the most attractive publications ever issued by that company. Besides detailed descriptions and price-lists of the high-grade Tessar and Protar lenses, shutters and other accessories of Bausch & Lomb manufacture, it contains a wealth of scientific material of importance to enthusiasts and specific suggestions on the selection of a lens. The seventy-one excellent reproductions of Tessar and Protar work are presented to splendid advantage on an ivory-tinted paper. A copy of this interesting publication may be obtained by writing to the Bausch & Lomb Optical Co., 634 St. Paul St., Rochester, N. Y.

What may fairly be said to be the biggest advance made in photography in twenty years is the Autographic Kodak, described and illustrated among the Eastman Kodak Company's advertisements in this issue. The simple, but clever device which distinguishes the Autographic Kodak from all other kodaks and cameras is said to have realized for its inventor the sum of $300,000, a reward for inventive genius which has awakened world-wide interest in the public press of this country, and, incidentally, brought to the Eastman Co. a volume of enthusiastic advertising well worth what is said to have been paid for the invention. But, aside from all this, the Autographic Kodak offers something for which the world has waited many years. To be able to write a line of any desired data on the picture

film, right after exposure, means much more than is apparent at first glance—among other things, an immense convenience for the tourist, contractor, surveyor, and all who use the camera for strictly record purposes; certainty of improvement for the amateur, who can record the technical details of his subject and its treatment, as he makes his exposures, and studies them for his after profit, and so on indefinitely. The Autographic Kodak is bound to replace all other kodak models in a short time. It needs only to be seen to be appreciated, its convenience and usefulness being irresistible. Read the advertisement carefully, or better, see the Autographic Kodak at your dealer's.

A new English reflex camera, The Busch-Telar, provides an extra mirror, which reflects the picture image from the glass screen to a vertical position, enabling the operator to focus the image and expose the plate at the level of the eye. This is a new feature in any camera, and valuable as helping the worker to avoid over-much foreground, especially in photographing long-distance subjects. The ordinary reflex focusing screen is provided as usual, and in both cases focusing can be done right up to the moment of exposure.

More and more, year by year, amateurs are awakening to the innumerable possibilities of making money with the camera. These possibilities are carefully considered and very fully explained in the THE PHOTO-MINIATURE No. 124, Photography for the Illustrated Press, and No. 120, Marketing Photographs for Publication. In these two little books you can get for fifty cents (at your dealer's) information which, if put into practical use, will bring you from $250 to $2,500 per year from the sale of your prints. This is worth looking into carefully.

Public enthusiasm grows everywhere concerning the "Loveliest Women Competition" of the Ansco Com-

pany, Binghamton, N. Y. It was a master-stroke of genius to throw such a contest open to the whole photographic world, and amateurs and professionals everywhere are crowding the Ansco Company's offices with their prints. If there be any reader of THE PHOTO-MINIATURE who is not already busy making pictures of his "loveliest women" for this competition, with its valuable prize awards of $5,000, we urge him or her to go to the nearest Ansco dealer and get particulars at once.

Velostigmat Lenses at Reduced Prices is the good news sent out by the Wollensak Optical Co., Rochester, New York. Particulars may be found in the new Wollensak catalogue, 1914, now ready for distribution. The success of Velostigmat Lenses has been a notable feature in the photographic trade of the past year, and may, in part, be attributed to the low prices asked for them, combined with their remarkable efficiency in actual work.

Plate Speed Equivalents. Although the H. & D. (Hurter and Driffield) system of marking the speed of plates and films is not used by American manufacturers, the increasing use of British plates and exposure meters on this side brings me many inquiries as to the speed equivalents of different brands of plates, as well as a table for comparing the speed factors of the Watkins and Wynne exposure meters. The following table and note contributed to the "Amateur Photographer" (London), by Mr. W. H. Jackson, will serve to answer these many inquiries.

This list of plate-speed equivalents will need no explanation to the ordinary or professional worker, but for the amateur or beginner a short explanation may be useful, especially in regard to the ratio and factor columns included in the list.

First, it may be stated that this list has been compiled from special formulæ in use in sensitometry, and therefore each line of equivalents is an absolute medium in

itself so far as the ratio placed opposite it is concerned. Thus, if a plate-maker issues a number a little higher or a little lower than a number on the list in either meter system, it is still subject to the ratio figure on the list, any small difference being quite negligible in ordinary practice. There are quite sufficient ratios set down here to cover any ordinary photographic work or plate speeds. The only thing is to take the nearest number to that on the plate box.

Speed Ratio	Plate Speeds. Standard Equivalents			Known Exposure H. & D. 100 ordinary, to × by Factor
	Watkins	Wynne	H. & D.	
1/8	720	f 181	490	.12
1/4	580	156	400	.25
5/16	469	138	319	.32
3/8	385	125	262	.38
7/16	334	117	227	.44
1/2	294	110	200	.50
5/8	251	100	170	.62
3/4	217	95	148	.75
7/8	178	85	121	.88
1	147	77	100 (base)	1.00
1 1/2	100	64	68	1.5
2	76	56	51	2.0
3	50	45	34	3.0
4	38	40	26	4.0
6	26	32	18	6.0
8	20	28	13	8.0
12	13	23	9	12.0
16	10	20	7	16.0
24	6	16	4	24.0
32	5	14	3	32.0
48	3	11	2	48.0
64	2	10	1	64.0

NOTE.—Small fractions of plate numbers, either way, have been purposely ignored, as they do not affect the ratio or working of the table.

Now the general use of the table can best be explained as follows:

Every photographer, amateur or otherwise, knows, or

should know, how to judge a clean and correct exposure on any subject, all conditions being considered, with a H. & D. 100 plate. On this knowledge the use of this list is based.

As an example, we will say that if a certain exposure required to be made on a H. & D. 100 plate would be 2½ sec., but that it is desired to use H. & D. 262, or Wynne F 125, etc., of which the factor is ·38. Therefore H. & D. 160 = 2½ sec. × ·38 = ·95, or just under 1 second for the faster plate, and so on.

Many years ago the English firm, Wratten & Wainwright, put on the market an unusually practical and common-sense darkroom lamp, fitted with W. & W. Safelights. We have often wished that this lamp were available in this country, and now note with pleasure that the actual lamp, in an improved form, has just been introduced by the Eastman Kodak Co., and can doubtless be obtained from any Kodak dealer.

Books and Prints

Photography in Colors. With a chapter on Kinematography in the Colors of Nature. By George Lindsay Johnson. Second (revised) edition. 1914. 243 pages; 13 full-page plates (5 in color) and numerous illustrations in the text. Cloth, $1.25; postage, 10 cents. New York: Tennant and Ward.

At this writing, this work is the only scientific and technical handbook to the various methods of producing photographs in colors. It is a textbook for amateurs and students of physics, and, therefore, necessarily somewhat technical in its treatment of its subject, giving full working details of all the processes of which it treats. Since the publication of the first edition, the advances made in photography in colors have been so great that the author thought it desirable to write an entirely new work, which would embody all the latest methods. A more satisfactory guide to practical color photography could not be desired, and we recommend it to our readers with pleasure.

The Art of Retouching Photographic Negatives and Finishing and Coloring Photographs. By Robert Johnson. Revised and rewritten by T. S. Bruce and A. Braithwaite. 1913. 90 pages; 16 illustrations. Paper boards, $1. New York: Tennant and Ward.

We find little of the original, well-known, "Johnson's Retouching" in this seventh edition, but the re-writing by Messrs. Bruce and Braithwaite has been well done, so that the book is, if possible, even more useful than the earlier edition. It offers a thoroughly practical guide for those who want to learn how to retouch the negative, and how to color prints and enlargements in water-color and in monochrome or in oil-colors.

In the last number of "Abel's Photographic Weekly" there is the following remarkable statement: "There has been an extraordinary dearth of real inside information on commercial photography. The magazines have had occasional articles on the subject, but there has been always a demand for a text-book which would go more fully into detail. This demand we have filled by issuing this week the first complete work on commercial photography. . . . The cost, $1.50, is a trifle, etc."

This statement is remarkable for its mendacity. "The first complete work on commercial photography" was THE PHOTO-MINIATURE No. 48, published in March, 1903, giving forty closely printed pages of practical information on its subject, written by a specialist in commercial photography, and illustrated throughout. The second complete work on "Commercial Photography" was THE PHOTO-MINIATURE No. 110, published in July, 1910, consisting of forty-four closely printed pages of practical information, with many illustrations. So that the volume so mendaciously boosted as above in "Abel's Weekly" is neither the first nor the most complete. Nor has there been any "extraordinary dearth of real inside information" on commercial photography since No. 48 was published.

Apart from the foregoing, the book published by "Abel's Weekly" is a very useful handbook for the commercial photographer, written by a practical worker, Mr. George W. Hance, and consists of forty-two pages of text, with many illustrations. The man who has to tackle commercial photography cannot know too much about the work, and so we advise everybody interested to get Mr. Hance's book, just as we hope every commercial worker has THE PHOTO-MINIATURE Nos. 48 and 110, both of which long ago sold out and are now out of print. When we say that Mr. Hance's book is quite as good as either of the two PHOTO-MINIATURES on the subject, we have given it the highest possible praise.

Telephoto of Martin's Point, Harrison River
Copyright, Canada, 1914, by F. Dundas Todd

SUBJECTS	NORMAL EXPOSURES WITHOUT MOVEMENT — WITH LENS SHUTTER			EQUIVALENTS ALLOWING FOR HIGHER EFFICIENCY OF FOCAL PLANE SHUTTER	MILES PER HOUR	SPEED, — 12 FEET — ↕			✕		
	SEC	STOP US	STOP F	SEC		SEC	STOP U.S	STOP F.	SEC	STOP US	STOP F
STREET GROUPS not rapid	1/15	16	16	1/45	1	1/20	36	24	1/40	18	17
WALKERS slow, CATTLE grazing	1/15	16	16	1/45	2	1/40	18	17	1/80	9	12
WALKERS medium	1/15	16	16	1/45	3	1/60	12	13.8	1/120	6	9.8
WALKERS fast	1/15	16	16	1/45	4	1/80	9	12	1/160	4.5	8.5
VEHICLES ordinary	1/15	16	16	1/45	6	1/120	6	9.8	1/240	3	7
VEHICLES rapid	1/15	16	16	1/45	8	1/150	4.8	8.8	1/300	2.4	6.2
SKATING ice	1/10	16	16	1/30	10	1/200	2.4	6.2	1/400	1.2	4.3
DIVING	1/75	16	16	1/225	10	1/200	18	17	1/400	9	12
SLEIGHING	1/10	16	16	1/30	12	1/240	2	5.6	1/480	1	4
YACHTS	1/75	16	16	1/225	12	1/240	15	15.5	1/480	7.5	11
Cycles, horses trotting	1/15	16	16	1/45	16	1/300	2.4	6.2	1/600	1 2	4.3
STEAMERS	1/75	16	16	1/225	23	1/480	7.5	11	1/960	3.75	7.75
Sports, autos	1/55	16	16	1/100	24	1/500	3 2	7.2	1/1000	1.6	5
Street cars (trolleys)	1/55	16	16	1/100	30	1/600	2.66	6.5	1/1200	1 33	4 6
Cycle races, gallopers	1/55	16	16	1/100	32	1/750	2 13	5.8	1/1500	106	4.1
Express trams, autos	1/35	16	16	1/100	60	1/1200	1.33	4.6	1/2400	66	3.25
Flight of birds	1/10	16	16	1/300	60	1/1200	.4	2.5	1/2400	.2	1.8

The usefulness of this table, which at first sight may look somewhat form
lack of information. All that the text-books tell us about focal-plane exposu
fraction of a second. Not a word is said about the diaphragm or stop to be u
ing upon (1) the "depth of focus" or depth of definition secured, and (2) th
we determine which diaphragm or stop to use to greatest advantage? The e
general knowledge of conditions and experience.

Since the beginner in focal-plane work lacks both knowledge and experie
ditions (without movement or focal-plane shutter) to the approximate exposu

How to use it: This Mr. Martin has done in his table, using the Wel
under the conditions named, at three different distances, and for the usual th
latter being calculated on the general basis of U. S. 16 (*f*/16) for the subjec

Explanation of table: The various subjects are given in the extreme left
subjects *without movement:* column 5 gives the equivalent, exposure, allowi
6 indicates the speed at which the subjects are presumed to move, expressed i
diaphragms required by the subjects when photographed at the distance give
pointed arrows over the word "stop" at the head of each division of each sect
kodaks are fitted with lenses numbered according to the U. S. system (now ob
diaphragms with the *f*/ values. These diaphragm values are calculated from
Thus all the figures given in the table are co-related and afford a pract
given beneath the table.

The table is based on that given in "Wellcome's Exposure Record" for
are taken. The other conditions presumed are as follows: Bright sunlight;
soda (kodak film, filmpack, etc.); developer, pyro-soda; lens, focal lengt

NCE, DIRECTION, EXPOSURE																		
	25 FEET									50 FEET								
	↕			⤧			↔			↕			⤧			↔		
	SEC	STOP U.S.	STOP F	SEC	STOP U.S.	STOP F	SEC	STOP U.S.	STOP F	SEC	STOP U.S.	STOP F.	SEC	STOP U.S.	STOP F	SEC	STOP U.S.	STOP F
3	1/10	72	34	1/20	36	24	1/30	24	19.5	1/5	144	48	1/10	72	34	1/15	48	27
3	1/20	36	24	1/40	18	17	1/60	12	13.8	1/10	72	34	1/20	36	24	1/30	24	19.5
	1/30	24	19.5	1/60	12	13.8	1/90	8	11.3	1/15	48	27	1/30	24	19.5	1/45	16	16
	1/40	18	17	1/80	9	12	1/120	6	9 8	1/20	36	24	1/40	18	17	1/60	12	13.8
5	1/60	12	13.8	1/120	6	9.8	1/180	4	8	1/30	24	19.5	1/60	12	13.8	1/90	8	11.3
	1/75	9.6	12.4	1/150	4.8	8.7	1/225	3.2	7.15	1/37	19.2	18	1/75	9.6	12.4	1/112	6.4	10.1
6	1/300	1.6	5	1/600	.8	3.6	1/900	.533	3	1/150	3.2	7.2	1/300	1.6	5	1/400	1.2	4.3
3	1/300	12	13.8	1/600	6	9.8	1/800	4.5	8.5	1/150	24	19.5	1/300	12	13.8	1/400	9	12
5	1/120	4	8	1/240	2	5.6	1/360	1.33	4.6	1/60	8	11.3	1/120	4	8	1/180	2.66	6.5
	1/120	30	22	1/240	15	15.5	1/360	10	12.6	1/60	60	31	1/120	30	22	1/180	20	18
5	1/150	4.8	8.7	1/300	2.4	6.2	1/450	1.6	5	1/75	9.6	12.4	1/150	4.8	8.7	1/225	3.2	7.2
3	1/240	15	15.5	1/480	7.5	11	1/720	5	9	1/120	30	22	1/240	15	15.5	1/360	10	12.6
2	1/250	6.4	10.1	1/500	3 2	7.2	1/750	2.2	5.9	1/125	12 8	14.3	1/250	6 4	10.1	1/375	4.4	8.4
8	1/300	5.33	9.2	1/600	2.66	6.5	1/900	1.77	5.3	1/150	10.66	13	1/300	5.33	9.2	1/450	3.54	7.6
4	1/375	4.26	8.25	1/750	2.12	5 8	1/1025	1.42	4.75	1/190	8.52	11.7	1/375	4.26	8.25	1/560	2.84	6.7
75	1/600	2.66	6.5	1/1200	1.32	4.6	1/1800	.888	3.8	1/300	5.33	9.2	1/600	2.66	6.5	1/900	1.77	5.3
6	1/600	.8	3.6	1/1200	.4	2.5	1/1800	.266	2	1/300	1.6	5	1/600	8	3.6	1/900	.533	3

l be evident after a brief explanation. It is designed to meet a very definite
ith the statement that, under given conditions, the exposure is this or that
lens! And yet, as we all know, the diaphragm has an all-important bear-
of light admitted to the plate in a given time. Hence the question: How do
the professional photographer in his studio, answers the question by his

nly course is to laboriously figure things out from known subjects and con-
he new conditions, including the equivalent diaphragm values.
le as his basis and expanding it, so that it includes the exposures required,
ns of movement, together with the diaphragms which should be used, these
ed *without* motion.
umn; columns 2, 3 and 4 give the normal exposures and stops for such
higher efficiency of the focal-plane shutter, still *without movement;* column
hour. Next follow three sections, each section giving the exposure and
p of each section, and for three directions of movement, as expressed by the
diaphragm or stop values are expressed in U. S. and *f/* figures, since all
repudiated by its originators), while many other opticians inscribe their
of U. S. 16 (*f*/16) chosen for the normal exposures in the first set of columns.
to the exposures and diaphragms required under the specific conditions

ge 242), from which most of the exposures here given for the 25 feet distance
M. to 3 P.M. (except for skating and sleighing); plate 200 H & D pyro-
s.

Telephoto of Mt. Baker, Cascade Range, Wash., from Victoria, B. C.—95 miles distant

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume XII SEPTEMBER, 1914 Number 134

Figures, Facts and Formulae of Photography

Some years ago my friend, the late H. Snowden Ward, published a handy reference book for photographers, under the title "The Figures, Facts and Formulæ of Photography." Revised and republished from year to year, it met with an enthusiastic welcome here and in Britain, but since Mr. Ward's death the book seems to have disappeared from view. To supply the ever-increasing need of some such reference book, wherein one may find standard or typical photographic formulæ, is the purpose of this number of THE PHOTO-MINIATURE. It has, to be sure, just over sixty pages as compared with over two hundred in the earlier volume referred to above. But I think it gives, in compact form, most of the figures, facts and methods likely to be wanted by the amateur today. The material offered has been gathered from hundreds of original sources, so that, as a collection, the little book contains nothing published in Mr. Ward's collection. I have used his title as decidedly the best available to describe the contents of the collection.

In the first rough draft of the book, credit was given to each author or journal or book quoted. This occupied much space, and compression was a stern necessity. I have, therefore, deleted all credits as to sources and make grateful acknowledgment here of the help received from photographic workers, writers and journalists,

from whose published methods I have taken whatever seemed to promise usefulness to the reader.

PLATE SPEEDS; EXPOSURE: LENSES

Plate Speed Equivalents with Speed and Exposure Ratios by W. H. Jackson

Speed Ratio	Plate Speeds. Standard Equivalents			Known Exposure H. &D. 100 ordinary, to × by Factor
	Watkins	Wynne	H. & D.	
1/8	720	f 181	490	.12
1/4	580	156	400	.25
5/16	469	138	319	.32
3/8	385	125	262	.38
7/16	334	117	227	.44
1/2	294	110	200	.50
5/8	251	100	170	.62
3/4	217	95	148	.75
7/8	178	85	121	.88
1	147	77	100 (base)	1.00
1 1/2	100	64	68	1.5
2	76	56	51	2.0
3	50	45	34	3.0
4	38	40	26	4.0
6	26	32	18	6.0
8	20	28	13	8.0
12	13	23	9	12.0
16	10	20	7	16.0
24	6	16	4	24.0
32	5	14	3	32.0
48	3	11	2	48.0
64	2	10	1	64.0

The general use of the table can best be explained as follows: Every photographer knows, or should know, how to judge a clean and correct exposure on any subject, all conditions being considered, with a H. & D. 100 plate. On this knowledge the use of this list is based.

As an example, we will say that if a certain exposure required to be made on a H. & D. 100 plate would be 2½ sec., but that it is desired to use H. & D. 262, or Wynne F 125, etc., of which the factor is .38. Therefore H. & D. 100=2½ sec., × .38=.95, or just under 1 second for the faster plate, and so on.

A Useful Table Giving the Exposures Required in Brightest Summer Sunlight 10 to 2, May, June, July (Clouds in Sky Reflecting Light into the Subject) with Ultra-rapid Plates of Speed, 250 Watkins (111 Wynne)

	Clouds	Sea	Open (distant) Landscape	Light foreground landscape etc.	Strong foreground, landscape etc.	Extra-heavy foreground	Under trees	Interiors light in color and well lighted		Interiors dark
								Min.	Sec.	Minutes
f/4	1–2000	1–1200	1–600	1–300	1–150	1–75	1/8		1/2	1/2
f/5.6	1–1200	1–600	1–300	1–150	1–75	1–35	1/4		1	1
f/8	1–600	1–300	1–150	1–75	1–35	1–18	1/2		2	2
f/11	1–300	1–150	1–75	1–35	1–18	1–8	1		4	4
f/16	1–150	1–75	1–35	1–18	1–8	1/4	2		8	8
f/22	1–75	1–35	1–18	1–8	1/4	1/2	4		16	15
f/32	1–35	1–18	1–8	1/4	1/2	1	8	1/2	—	30
f/45	1–18	1–8	1/4	1/2	1	2	16	1	—	60
f/64	1–8	1/4	1/2	1	2	4	30	2	—	120

Calculating Outdoor Exposures (Gaston M. Alves). This method is based on stepping one's own shadow and requires the sun to be shining. It applies for all latitudes and longitudes, seasons of year and time of day. Average scene, bright weather, fast plates or films.

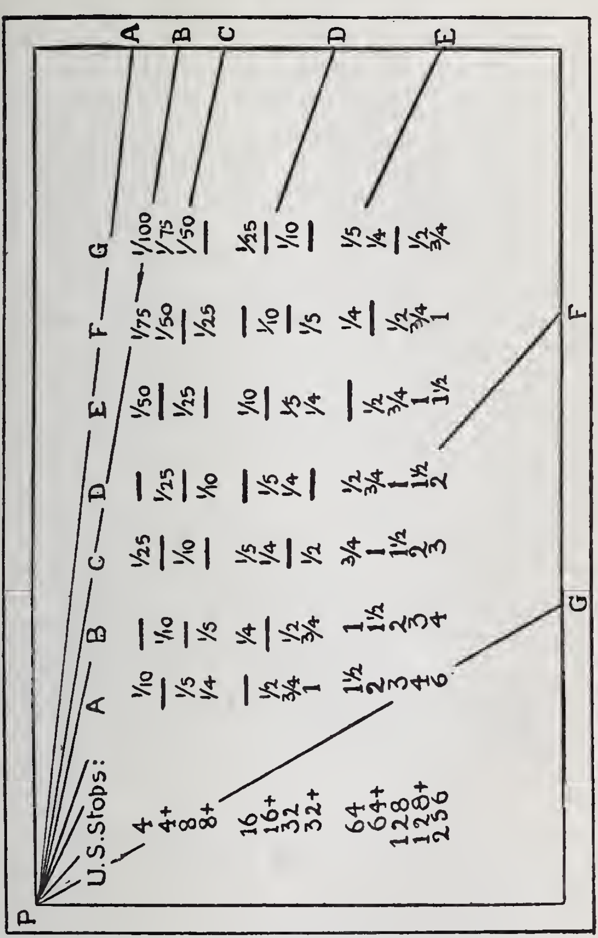
A person usually steps in regular, natural step, about 40 per cent of his own height, and it is easy to compute mathematically the length of his shadow on level ground, at given altitudes of the sun. On reasonably level ground let the operator note the point where his shadow reaches. Then let him measure the distance of this point in his usual steps. The table below will correctly give the proper exposures.

U. S. Stops	23 steps	15 steps	11 steps	7 steps	5 steps	3 steps	1½ steps
4........	1/10	..	1/25	..	1/50	1/75	1/100
4+......	..	1/10	..	1/25	..	1/50	1/75
8........	1/5	..	1/10	..	1/25	..	1/50
8+......	1/4	1/5	..	1/10	..	1/25	..
16.......	..	1/4	1/5	..	1/10	..	1/25
16+.. ..	1/2	..	1/4	1/5	..	1/10	..
32.......	3/4	1/2	..	1/4	1/5	..	1/10
32+.....	1	3/4	1/2	..	1/4	1/5	..
64	1 1/2	1	3/4	1/2	..	1/4	1/5
64+.....	2	1 1/2	1	3/4	1/2	..	1/4
128......	3	2	1 1/2	1	3/4	1/2	..
128+....	4	3	2	1 1/2	1	3/4	1/2
256......	6	4	3	2	1 1/2	1	3/4

4+means an opening halfway between U. S. 4 and U. S. 8, and so on.

With this for the average scene as ⅔, then the same scene with the sun obscured by a light veil of cloud may be taken as 1; with sun covered by a dense cloud as 1½; the sky covered by thin clouds as 2; or so covered with clouds as to show only general position of the sun as 3.

Alves' Outdoor Exposure Card



See following page for explanation of use.

This table of exposures is wholly practical, calculated for normal conditions, bright weather and fast plates or films. The reader should make an exact copy on stiff, white card, paying particular care to the angles given in the diagram. To use, hold the card vertically, the top edge conforming to the horizon and the face of the card so turned that the sun will light it. A pin stuck, or the point of a pencil held at the point P in the diagram will cast a shadow giving the proper angle. Example: If the cast shadow gives the angle P A, use the exposures given in column A according to the stop used. Note that 4+means an opening halfway between U. S. No. 4 and U. S. No. 8, and so on.

Exposures in Photographing Moving Objects. When a moving object is within the field of a lens, its image will be seen moving on the ground glass of the camera. To arrest this motion (which is essential to the obtaining of a sharply defined picture of the moving object), the aperture of the exposure shutter must open and close at a higher rate of speed than the image of the object moves across the ground glass or focal plane of the camera.

The simplest method of calculating exposures for moving objects is that given by S. Lawrence, as follows: It supposes the distance of the object from the camera, the speed at which the object is traveling, and the focal length of the lens to be known beforehand. Then let D equal the distance between the object and the lens, expressed in inches; S equals the speed at which the object is traveling, expressed in inches per second; and F equals the focal length of the lens expressed in inches. Then

$$E \text{ (exposure)} = \frac{D}{S \times 100F}$$

Thus, with object traveling 12 miles per hour, distance of 50 feet, lens 6 inches focal length, we have

D (distance) = 600 inches
S (speed) = 211 inches per second
F (focus) = 6 inches (multiplied by 100 in use)

and according to the formula:

$$E \text{ (exposure) } = \frac{600}{211 \times 600} = \frac{1}{211} \text{ second}$$

With this simple formula Mr. Lawrence supplies a convenient table, giving at a glance the number of inches per second equivalent to various rates of speed usually expressed in miles per hour, as follows:

Miles per hour	equals ins. per sec.	Miles per hour	equals ins. per sec.
1	18	18	317
2	36	20	352
3	53	25	440
4	70	30	528
5	88	35	616
6	106	40	704
7	123	45	792
8	141	50	880
9	158	55	968
10	176	60	1056
11	194	65	1144
12	211	70	1232
13	229	75	1320
14	246	80	1408
15	264	90	1584
16	282	100	1760
17	299		

When it is possible to work at a distance from the object of approximately one hundred times the focal length of the lens used, then "inches per second" figures in this table, considered as fractional parts of a second, may be used as the required exposure without further calculation, or normal conditions. Example: 6-inch lens at 50 feet from the object, the exposure for an object traveling 10 miles per hour would be 1-175th second.

All these exposures are for objects traveling directly across the field of view at right angles to the lens. If the object approaches or recedes at an angle of 45° or at an angle of 10°, then the exposures would be twice and three times as long, respectively, as those given for the broadside view. Similarly, the rule which says that the exposure required for any given distance should be

doubled in length for twice that distance or halved for half that distance, should be kept in mind when using this convenient table, which practically covers the requirements of ordinary movement photography.

Pinhole (Needle-hole) Photography (J. B. Thomson).

Making the Needle-hole.—Select a plate of thin flexible copper or brass about ½ inch square. Press the center with some rounded point, so as to form a little "boss" or mound on one side. Rub down this boss on fine stone until the level is reached. Fix a *fine* needle in a cork holder, and press from the center of the hollow until *just the point* is through—the plate lying on a level piece of wood or cardboard. Note, with a magnifier, that the tiny hole has ragged metal standing up all round. *Cut* this off with a sharp penknife, and now begin to use the needle designed for the aperture, No. 10, 11, or 12. Widen the hole carefully, examining with the magnifying lens, and rub down still further on the stone, until you have a hole perfectly round and perfectly clean, and as thin at the edges as can safely be made.

Best Sizes of Needle-hole.—No. 10 needle (makes hole about $\frac{1}{55}$ of an inch) for landscapes or in poor light; No. 11 (hole $\frac{1}{65}$ inch) for interior or architectural work where finer definition is required; No. 12 (hole $\frac{1}{75}$ inch) for greatest sharpness, as in copying. See further data given after the table on the following page for exposure variations with different apertures.

Exposures: Time and Date Table.

Find the proper letter in this table, and read in corresponding column below:

Hour A.M. P.M.	June	May July	April Aug.	Mar. Sept.	Feb. Oct.	Jan. Nov.	Dec.
11 to 1	A	A	A	B	D	F	G
10 or 2	A	A	B	C	F	G	H
9 or 3	A	A	C	D	G	J	K
8 or 4	B	B	D	F	I		
7 or 5	D	E	F	H			
6 or 6	E	F	H				
5 or 7	G	H					

Exposure Table (in seconds)

Subject	A	B	C	D	E	F	G	H	I	J	K
1. Distant view; no near foreground; beach and river scenes well lighted	3	4	5	6	8	10	12	16	24	30	60
2. Near view with long distance; light objects near; field and road well lighted..........	6	8	10	12	16	20	24	30	48	60	120
3. Near view with foliage or shadows in foreground; street scenes and portraits out-of-doors	12	16	20	24	32	40	48	60	90	120	240
4. Interior well lighted with clear-glass windows; glades under trees......	2 m.	3 m.	4 m.	5 m.	6 m.	8 m.	10m.	14m.	18m.	24m.	48m.

The figures in the above table are for extra-rapid plates used in perfect sunshine, with a No. 10 needle-hole 4 inches distant from the plate.

Allow for other conditions as follows: (*a*) *Plates.*—For medium rapid, half as much again; for ordinary, double exposure. (*b*) *Light.*—Sun slightly veiled but sky clear, half as much again. Sky clouded, but atmosphere clear, double. Sky gloomy, four to eight times. (*c*) *Aperture.*—For No. 11 needle-hole, half as much again; for No. 12, double; for No. 8, half exposure. (*d*) *Plate distance.*—For every inch beyond four, a half more. For every inch less than four, reduce by half.

Telephoto Lens Calculations. The calculations necessary in using telephotographic lenses are easily worked out. Nothing of a mathematical nature is necessary, the figuring in each case being not more difficult than a rule-of-three sum. In this section we enumerate all the factors of the calculations, and affix examples of the manner in which they are applied to the working of the lens. The factors are

f'. Focal length of the positive lens.
f''. Focal length of the negative lens.
a'. Aperture of the positive lens.

a''. Aperture of the negative lens.
s. Separation between the positive and negative lenses.
b. Bellows extension for any particular magnification.
m. Magnification of the image on the ground glass.
d. Diagonal of the plate to be covered.
t. Time of exposure.

1. What is the best focal length for the negative lens for use with any given positive? For moderate powers and cameras of short bellows the f'' should be about two-thirds that of f'. For example, with a positive lens of 7-inch focus and a bellows of 12-inch extension, the negative lens might well be of 5-inch focus. For higher powers and longer bellows the best f'' is about half that of the positive.

2. What is the necessary separation between the positive and negative lenses? This is variable. The minimum is equal to the difference of their focal lengths (f' minus f''). The maximum is equal to f'. Between these limits the separation depends upon the degree of magnification. The formula is—

$$s = f'' + \frac{f''}{m}$$

3. What length of bellows is required to give a desired magnification? The answer is in the next formula—

$$b = f''(m - 1)$$

For example, to magnify four diameters with a negative lens of 3-inch focus, we get—

$$b = 3\,(4 - 1) = 9\text{-inch length of bellows.}$$

4. What is the magnification possible with any given length of bellows? In this case the formula is—

$$m = \frac{b}{f''} + 1.$$

For example, with a negative lens of f'', equal to 3 inches, and a bellows extension of 12 inches, what enlargement can be secured?

$$m = \frac{12}{3} + 1 = 5 \text{ diameters.}$$

5. What size plate can be covered with any combination at any bellows extension?

$$d = \frac{b}{f''}\left\{\frac{a'f'' + a''f'}{f' - f''}\right\}$$

For example, with a positive lens of 7-inch focus and 1-inch aperture and a negative lens of 3-inch focus and also 1-inch aperture, and a bellows length of 12 inches, what is the diagonal of the plate covered?

$$d = \frac{12}{3}\left\{\frac{1 \times 3 + 1 \times 7}{7 - 3}\right\} = 4\left\{\frac{10}{4}\right\} = 10 \text{ inches.}$$

This is obviously ample allowance for a 5 x 7 plate.

6. What is the increase of exposure in any case? The rule is, ascertain the correct exposure in the case at hand for the positive used alone, multiply this figure by the square of the magnification; t = m times exposure for positive lens alone.

These formulas are not so forbidding as they may look to the non-mathematical eye; they are merely so many simple ways of arriving at the data the telephotographer is sure to want in the course of his work, and they are inserted in this monograph because we think the reader will very often wish to consult them.

Telephoto Exposures. The rule for finding the exposure in telephotography is very simple. It is: Multiply the exposure that would be given by the positive lens alone by the square of the magnification. For example, if with our 6-inch positive lens, the exposure, calculated by Wynne meter, or other means, is found to be 2 seconds, then with the 3-inch negative lens attached, giving a magnification of 5 times, the exposure would be $2 \times 25 = 50$ seconds. The rule is easily committed to memory. In calculating exposures, however, it is well to bear in mind that there are certain modifying factors, such as distance and intervening atmosphere, to be taken

into account. Howard Farmer gives a table which shows the ratios of exposure at varying distances.

Distance of nearest shadow r nearest important object	Ratio of exposure
10 ft. to 30 ft.	16
30 ft. to 100 ft.	8
100 ft. to 300 ft.	4
300 ft. to ¼ mile	2
Beyond ¼ mile	1

Lens Apertures and Exposure Ratios. Two systems of numbering lens apertures (diaphragms or stops) are in general use. In the Uniform System, applied to all kodak lenses, the lens apertures are so graded from the largest to the smallest that each succeeding aperture is about half the area of the aperture preceding it, and requires double the exposure which the preceding aperture would require. This system is a material help in calculating exposures, as there is a definite and easily remembered relation between the exposure required with any one aperture or stop and that required with any other in the series. According to this system, the apertures are numbered 1, 2, 4, 8, 16, 32, 64, 128.

In the *f/* value system, the lens apertures represent the relation between the diameter of the aperture and the focal length of the lens. For example: If we have a lens of 4 inches focal length, and the diameter of the largest available aperture is 1 inch, that aperture is known as *f/*4, being one-fourth of the focal length of the lens. Reducing the diameter of the aperture to half an inch, we get *f/*8, equaling one-eighth of the focal length of the lens, and so on down to the smallest aperture, *f/*45, which is 1-45th of the focal length of the lens. A disadvantage of this system is that it provides no fixed ratio between one aperture and another, simply expressing the light-passing capacity of each aperture by a figure which tells us the relation between the diameter of the aperture and the focal length of the lens. Thus we have apertures numbered by this system as follows: *f/*4, *f/*4.5, *f/*5.6, *f/*6.3, *f/*7.7, *f/*8, *f/*11.3, *f/*16, *f/*22, *f/*32, *f/*45.

The following table shows the equivalent values of the figures, and gives the exposure ratios:

U.S. Nos.	1		2			4	8	16	32	64	128
F/Value Nos.	f/4	f/4.5	f/5.6	f/6.8	f/7.7	f/8	f/11.3	f/16	f/22	f/32	f/45
Expos. Ratio	1		2			4	8	16	32	64	128

This table tells us that, with any given subject and set of conditions, the lens with *f*/4.5 (U. S. 1¼) as its largest aperture, will give us the picture image in one-quarter of the time required by a lens with *f*/8 (U. S. 4) as its largest aperture, and in about one-sixteenth of the time required by a lens whose largest aperture is *f*16 (U. S. 16).

Change in f/ Values with Halves of Doublet Lenses. In most lenses the diaphragm or stop values become quite wrong when the front or back component of a doublet lens is used alone as a single lens. Usually, each component is double the focal length of the complete lens, so that each diaphragm value (or stop number) requires to be doubled, i. e. requiring four times the exposure needed with the complete lens under identical conditions as to light, plate, subject, etc. Some lenses are made with one component double, and the other one-and-a-half times the focal length of the complete lens. In such cases the latter component will require exposures 1½ x 1½ times (twice) those for each stop when using the complete lens. The user of a lens of this unsymmetrical type should carry a card giving the stop values for the whole lens and each of its components. Thus, for a lens of 5 inches focal length, composed of single components of 10 inches and 7½ inches, the values of the stops will be as follows:

Complete lens:	f/5.6	f/8	f/11	f/16	f/22	f/32	f/45
10-inch lens:	f/11	f/16	f/22	f/32	f/45	f/64	f/90
7½-inch lens:	f/8	f/11	f/16	f/22	f/32	f/45	f/64

Hyperfocal Distance. This means the distance from the camera beyond which all objects will be in fairly sharp focus, and which gives the maximum depth of definition. This distance varies according to the focal length of the lens and the aperture in use—presuming for the moment that 1-100th of an inch is accepted as the standard disc of confusion. It can be

found, for any lens and aperture, by the following simple formula: Multiply the focal length of the lens by itself, then by 100, and divide the result by the aperture (*f*) number, and by 12 to bring it to feet. For example: We require the hyperfocal distance of a four-inch lens at *f*/4:

$$\frac{4 \times 4 \times 100}{4 \times 12} = 33 \text{ feet, 4 inches.}$$

The following table gives, at a glance, the hyperfocal distances for lenses of different focal lengths with different stops, calculated on the basis of a disc of confusion of 1-100th of an inch as the standard of sharpness.

Table of Distances on which to Focus with Lenses of Different Length and Different Lens Apertures (Stops), so that all Objects Beyond Half that Distance will be in Focus. Disc of Confusion Taken as 1-100 of an Inch.

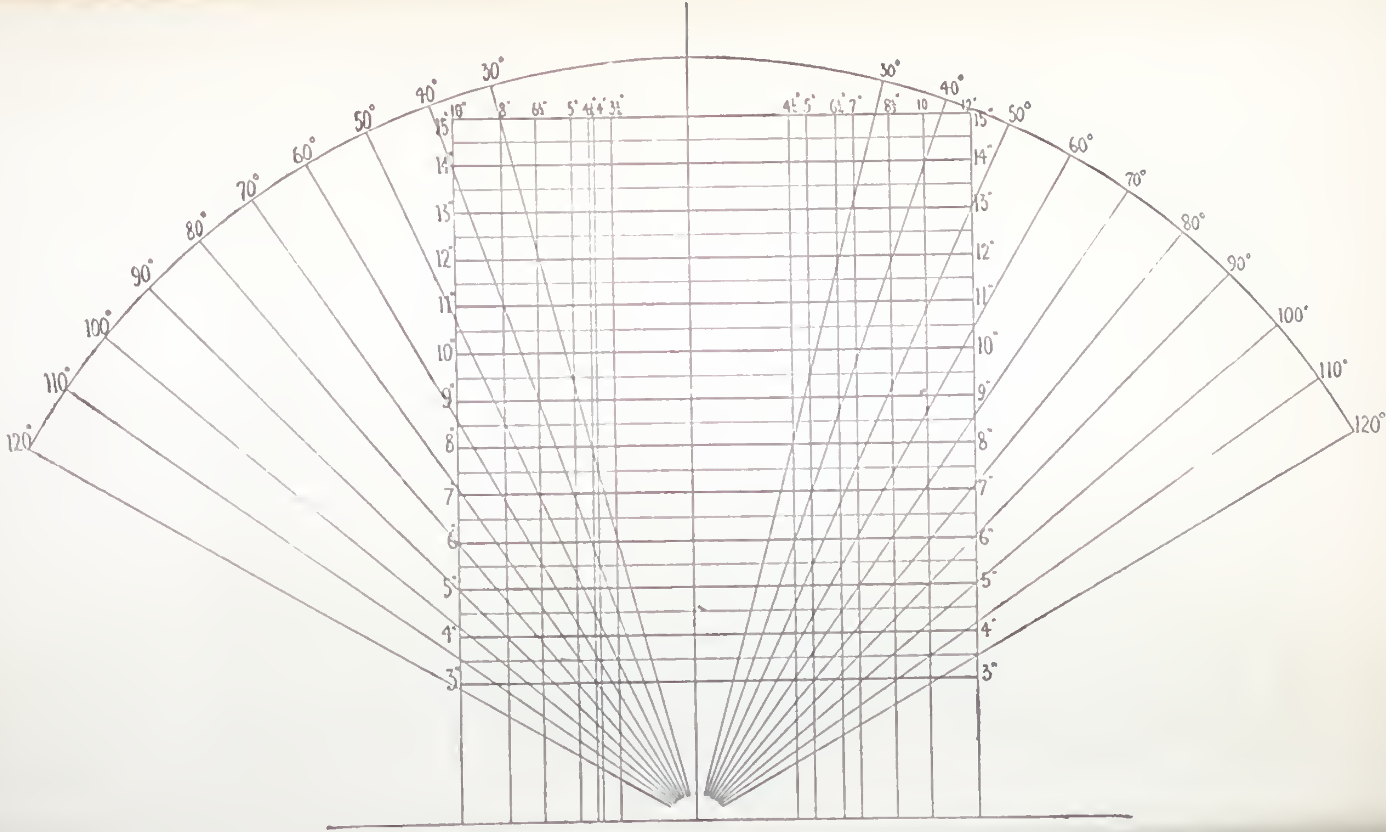
Focus of Lens in Inches	Diagram Apertures: F Values and U. S. Numbers							
	F/4 U.S.1	F/5.6 U. S. 2	F/6 U. S. 2.25	F/7 U. S. 3.06	F/8 U. S. 4	F/11.3 U. S. 8	F/16 U. S. 16	F/22 U. S. 32
	Distances in Feet							
2½	13	10	9	8	7	5	3½	3
3	19	14	13	11	10	7	5	3½
3½	25	18	17	15	13	9	7	4
4	34	24	22	19	17	12	8	6½
4¼	38	27	25	21	19	14	10	7
4½	42	30	28	24	21	15	11	8
4¾	47	34	32	27	24	17	12	9
5	52	36	35	30	26	19	13	10
5½	63	45	43	36	31	23	15	12
6	75	54	50	42	38	27	19	14
6½	88	62	58	50	44	31	22	16
7	101	72	68	57	51	37	25	17
7½	117	83	78	64	58	42	29	21
8	132	96	88	76	68	48	32	24
8½	150	104	100	84	76	56	38	27
9	168	120	112	96	84	61	42	31
9½	190	133	125	107	95	68	47	34
10	208	148	140	120	104	75	52	38

Fixed Focus with a Focusing Camera. Any small focusing camera can be used as a "fixed focus" camera, by setting the lens at a point which is a compromise between its position for near and for distant objects. Thus, the following table shows how certain of the Kodak cameras which have a focusing arrangement may be used as "fixed focus" cameras at will: No. 1a Kodak, R. R. type, and No. 3 Folding Kodak.—The focusing scale is set to 25 feet and the stop midway between No. 8 and No. 16. No. 2 Folding Brownie and No. 2a Folding Brownie.—The focusing scale is set to 20 feet and the stop midway between No. 1 and No. 2. No. 3 Folding Brownie.—The focusing scale is set to 25 feet and the stop midway between No. 8 and No. 16.

Size of Object in Picture Image. This depends upon the focal length of the lens, and the distance of the object away from the camera. In order to ascertain how far away an object of known size must be in order to get an image of any desired size with a lens of known focal length: Multiply the height of the object in inches by the focal length of the lens in inches. This will give (in inches) the distance at which the object must be placed to give an image one inch high. Example: a man 72 inches high, photographed with a lens of 5 inches focal length. The distance for an image 1 inch high will be 72x5 = 360 in. = 30 feet. At half this distance (15 feet) the image will be 2 inches high, and so on.

Angle of View. This indicates the amount of the subject included on the plate by the lens in use. It varies with the relation of the focal length of the lens to the base measure of the plate used. The table on the following page shows the angle of view included on plates 3¼ x 4¼ to 10 x 12, by lenses of different focal lengths, from 3 to 15 inches.—Julius Martin.

To use the diagram, follow the vertical line, which indicates the base measurement of the plate to be used until it intersects the horizontal line which indicates the focal length of the lens used. At this intersection, take the nearest angular line and follow it to the arc at



30°
40°
50°
60°
70°
80°
90°
100°
110°
120°
3"
4"
5"
6"
7"
8"
9"
10"
11"
12"
13"
14"
15"

the top of the diagram. Here the angle of view included by that lens upon the plate to be used is expressed in degrees. Examples: What angle of view will be included by a 5-inch lens upon the longest way of a 5 x 7 plate? On the topmost horizontal line find the figure 7; follow this line until it cuts the line figured 5 at the right-hand of the diagram. At the point of intersection follow the angular line to the arc and the angle included is seen to be 70°. In the same way it is seen that the same lens, used on the narrow base (5 in.) of the plate, includes an angle of about 52°, while used on a plate whose base measures 12 inches, we get an angle of 100°.

Enlarging and Reducing. Table of Distances required between easel and negative and lens and plate when enlarging or reducing — by linear measure. (Photographer's Notebook).

Number of Times—

1	2	3	4	5	6
2–2	3–1½	4–1⅓	5–1¼	6–1⅕	7–1⅙
7	8	9	10	11	12
8–1⅙	9–1⅛	10–1⅑	11–1 1/10	12–1 1/11	13–1 1/12

Multiply the figures in the second line of spaces by the equivalent focus of the lens used. Example: To enlarge a print 4 diameters with a lens of 6 inches focal length, the easel must be placed 30 inches from the lens, and the plate (negative) 7½ inches from the lens.

To reduce, change the places of easel and negative in each case.

DARKROOM FORMULAS

Darkroom Work-table and Shelves may be made impervious to acid and alkali solutions.

Prepare the following solutions: 1. Iron sulphate, 4 parts; copper sulphate, 4 parts; potassium permanganate, 8 parts; water, q. s., 100 parts. 2. Aniline, 12 parts; hydrochloric acid, 18 parts; water, q. s., 100 parts, or aniline hydrochlorate, 15 parts; water, q. s., 100 parts.

By the use of a brush, two coats of solution No. 1 are applied while hot, the second coat as soon as the first is dry. After solution No. 1 has dried, the excess of solution which has dried upon the surface of the wood is throughly rubbed off before the application of solution No. 2. Then two coats of solution No. 2, and the wood allowed to dry thoroughly. The black color does not appear at once, but usually requires a few hours before becoming ebony-black. Later a coat of raw linseed oil is to be applied, using a cloth instead of a brush, in order to get a thinner coat of the oil. The linseed oil may be diluted with turpentine without disadvantage, and after a few applications the surface will take on a dull, and not displeasing, polish. The table-tops are easily cleaned by washing with water or suds after a course of work is completed, and the application of another coat of oil puts them in excellent order for another course of work.

Hyposulphite of Soda. To dissolve hypo quickly, put it in a cone-shaped muslin bag, suspend over any wide-mounted jug or container, and pour hot water through the bag.

An ordinary teacup holds 4 ounces of pea crystal hypo. This dissolved in a pint of water makes the ordinary plain fixing-bath for negatives. For print-out papers add three pints of water.

One pound of hypo dissolved in a pint of hot water and diluted to make 32 ounces of solution makes a 50 per cent solution. For fixing plates or films, take equal parts of this solution and water. For papers, take 1 part stock solution and 3 or 4 parts water.

Hypo, solid, or in solution, should not be handled during other printing manipulations, as even minute traces of hypo will produce defects in prints.

Plain Fixing-bath. For plates and films 1 ounce of hyposulphite of soda to 3 or 4 ounces of water.

For print-out and self-toning papers use the fixing-bath advised for the paper in use. A typical bath for P. O. P. is 1 ounce of hyposulphite of soda in 10 ounces of water. For Paget self-toning paper, the bath advised is 3 ounces hyposulphite of soda to 20 ounces of water.

Alkaline Fixing-bath. (Chapman Jones.) Dissolve ¼ ounce sulphite of soda (crystal) and 30 grains sodium carbonate (crystal) in 2 ounces of water, and add this to the usual plain hypo solution of 1 ounce of hypo to 3 ounces of water.

Acid Fixing-Bath. Standard formula, for plates and films only. May be used repeatedly. Remains clear until exhausted. Clears and hardens the negative film. Provide bottle or container for over 64 ounces solution. Take warm water, 56 ounces; add sulphuric acid, 1 dram; sulphite of soda (crystals), 2 ounces. Dissolve thoroughly and add hyposulphite of soda, 16 ounces. When thoroughly dissolved, add to this a chrome alum solution made (previously) by dissolving 1 ounce of chrome alum in 8 ounces of water, and the bath is ready for use when cold. Negatives should remain in this bath fully 15 minutes after the whitish bromide of silver has disappeared from the film.

Kodak Acid Fixer for plates and films. Dissolve in order here given: Water, 64 ounces; hyposulphite of soda, 16 ounces; sulphite of soda (desiccated), 1 ounce. If sodium sulphite *crystals* are used, take 2 ounces. When thoroughly dissolved, add powdered alum, ½ ounce; citric acid, ½ ounce.

For Velox and development papers. Dissolve in order given: Water, 64 ounces; hyposulphite of soda (crystals), 16 ounces. When dissolved, add the following hardening solution: Water, 5 ounces; sulphite of soda (desiccated), ½ ounce; acetic acid No. 8, 3 ounces; powdered alum, 1 ounce. Keep in tightly corked bottles. One pint will fix 72 4x5 prints.

Simple Acid Fixing-bath. Dissolve 1 pound Merck's pure dry sodium bisulphite in 64 ounces of water. This is the hardener and keeps indefinitely. To make the fixing-bath, dissolve 1 pound of hyposulphite of soda in 64 ounces of water and add 8 ounces of the bisulphite solution. In very hot weather increase the amount of bisulphite added to 10 or 12 ounces.—E. A. Spaulding.

Stains on Negatives. Many stains on negatives will yield to a simple clearing-bath of the acid-alum type, as

follows: Dissolve 1 ounce of alum and ¼ ounce citric acid in 16 ounces of hot water. Ready for use when cold. May be used repeatedly. Any fungoid growth appearing may be filtered off, but does not affect the action of the solution.

Another method is to first soak the stained negative in a 5 per cent solution of alum to harden the film, and then clear it in ammonium sulphocyanide, 30 grains; water, 1 ounce; to which, when dissolved add 20 minims nitric acid previously diluted with 1 ounce of water. The fumes of this bath are corrosive, so it must not be inhaled. Work at an open window.

A negative stained yellow by insufficiency of sodium sulphite in the developer can be cleared of the stain by exposure, when dry, to bright light for a few days.

Cleansing Bottles, Porcelain Trays, etc. Dissolve ¼ ounce potassium bichromate in 10 ounces hot water. When dissolved and the solution is cold, add ½ ounce sulphuric acid, pouring it in a thin stream, slowly, with constant stirring. This will make the mixture hot again. Allow to get cold before bottling for use. The solution is strongly corrosive. Keep from hands and clothes.—M. Carey Lea.

Stripping the Film from a Cracked Negative. Fasten the negative to a clean, selected piece of glass with any good glass cement. Then place in a dish of cold water for three or four hours, after which stand it up for a few minutes to drain. When surface dry, place for 5 minutes in a mixture of 6 drams of formalin, 1 dram of glycerine, and 3 ounces of water, after which set aside to drain and get quite dry. When quite dry, flow the film side of the negative with two coats of celluloid varnish, letting the first coat thoroughly dry before applying the second. Now make a clean cut along the four sides of the negative, at least one-eighth of an inch from the edges of the plate, using the sharp point of a knife. Insert the point of the knife under one corner of the film and it will peel off perfectly, giving a stiff, but flexible film, which can be printed from either side at will. If desired this plan can be remounted on glass to give a new glass negative.

WEIGHTS AND MEASURES SIMPLIFIED
MAKING CHEMICAL SOLUTIONS

American and English Weights and Measures. Chemicals are usually sold by avoirdupois weight, but, unless otherwise mentioned, photographic formulas are generally made up by apothecaries weight.

Avoirdupois:

1 dram	=	$27\frac{11}{32}$ grains.			
1 ounce	=	437½ grains.			
1 pound	=	7000 grains.			

Apothecaries:

1 scruple	=	20 grains.			
1 dram	=	60 grains.			
1 ounce	=	480 grains.			

American Fluid Measure:

1 dram	=	60 minims.			
1 ounce	=	8 drams	=	480 minims.	
1 pint	=	16 ounces			
1 quart	=	2 pints	=	32 ounces.	
1 gallon	=	4 quarts	=	128 ounces.	

English Fluid Measure:

1 dram	=	60 minims.			
1 ounce	=	8 drams	=	480 minims.	
1 pint	=	20 ounces.			
1 quart	=	2 pints	=	40 ounces.	
1 gallon	=	4 quarts	=	160 ounces.	

NOTE: 1 ounce of metallic silver = 480 grains; but 1 ounce silver nitrate = 437½ grains.

Metric Measures. There is no mystery about the metric system, nor half the complication which the text-books make of it. I can give it here in a few words. The cubic centimeter (cc.) is the unit of liquid measure. It is equal to about 17 minims of common measure. One fluid ounce is about 30 cc.'s. 1,000 cc.'s make one liter. So much for measures. No minims, fluid drams, ounces, pints, American or English. Now as to weight. One cc. of pure water weighs one gramme. A gramme is thus about 15 grains. An ounce by weight equals about 30 grammes (these are only approximate; we will have the exact figures directly), 1,000 grammes equal one kilogramme—usually abbre-

viated to "kilo," but not used so much as the expression "1,000 grammes." Kilo equals about 2¼ lbs.

The prefixes, deci- (tenth), centi- (hundredth), and milli- (thousandth) are joined to the word gramme, but it is far more usual to write these subdivisions thus: .1, .01, .001; and to speak of them as "point one," etc.

There are no special appellations for the subdivisions of the cc. These are written .5 cc., .01 cc., etc. ("half a cc., "point nought one" or one-hundredth of a cc., etc.). Here you have, then, everything which replaces the many variants of the weights and measures in usage in America and England, the gramme, the cc.—with the liter and the kilo as addenda.

A box of metric weights from 500 grammes down to .1 gramme supplies our wants as regards weighing. For measures, a ten cc. measure (graduated into tenths) replaces the dram or minim graduate.

To convert metric measures to American or English equivalents use the following tables.

Grammes to Grains, etc.

Grammes to grains,	multiply by	15.432
" " scruples (Ap.),	" "	1.296
" " drams (Ap.),	" "	3.888
" " ounces (Av.),	" "	.035
" " pounds,	" "	.002205

Cc.'s to Minims, etc.

Cc.'s to minims,	multiply by	16.894
" " drams (fl.),	" "	282
" " ounces (fl.),	" "	.035

English Equivalents of Metric Measures.

1 gramme	=15.432 grains
100 grammes	=3 ounces; .431 grains (Av.)
1 kilo	=2 pounds; 3 ounces; 1.20 grains (Av.)
1 cc.	=16.9 minims.

Coins as Weights: These are sufficiently accurate for making formulas.

(American.)

	Grains	Grammes
Dime (*10 cents*)	40	2½
Cent	50	3.1/10
Nickel (*5 cents*)	80	5.
Quarter Dollar	100	6.¼
Half Dollar	200	12.½

(English.)

Three-penny piece	= 40 grains.
Sixpence	= 40 grains.
Shilling	= 80 grains.
Shilling + Three-penny piece	= 100 grains.
Half-crown	= 200 grains.
48 pennies	= 1 pound.

Per Cent Solutions. A table giving the weight in grains (avoirdupois) of any chemical substance required to make a per cent solution from 1 per cent to 50 per cent. (Higgins.)

For each fluid ounce of a

1 per cent solution take . .	4.37 grains.
2 per cent solution take . .	8.74 grains.
3 per cent solution take . .	13.11 grains.
4 per cent solution take . .	17.48 grains.
5 per cent solution take . .	21.85 grains.
6 per cent solution take . .	26.22 grains.
7 per cent solution take . .	30.59 grains.
8 per cent solution take . .	34.96 grains.
9 per cent solution take . .	39.33 grains.
10 per cent solution take . .	43.70 grains.
15 per cent solution take . .	65.55 grains.
20 per cent solution take . .	86.40 grains.
25 per cent solution take . .	108.25 grains.
30 per cent solution take . .	131.10 grains.
35 per cent solution take . .	152.95 grains.
40 per cent solution take . .	174.80 grains.
45 per cent solution take . .	196.65 grains.
50 per cent solution take . .	218.50 grains.

Making Chemical Solutions. Some substances are very soluble in water, some are not; some require hot water, and so on. Much depends on the quality and fineness of division of the chemicals, the temperature of the water and the way the two are mixed. Let us take them in their order.

I. *Chemicals dissolving much more quickly if hot water is used:* Oxalic acid, hydroquinone, alum, borax, lead nitrate, mercuric chloride, potassium ferricyanide, potassium ferrocyanide, potassium oxalate, sodium sulphite, sodium thiosulphate (hypo).

II. *Chemicals dissolving very quickly in cold water:* Ammonium sulphocyanide, ammonium bromide, citric acid, potassium bromide, potassium carbonate, potassium cyanide, potassium bichromate, potassium hydroxide (caustic potash), sodium acetate, sodium carbonate, sodium hydroxide (caustic soda), sodium chloride (common salt), uranium nitrate.

Some salts *must not* be dissolved in hot water if they are to be obtained unaltered in the solution. The chief of these are: Potassium metabisulphite, sodium bicarbonate, sodium sulphantimonate (Schlippe's salt).

Don't filter if you can do anything else. It is better to let any deposit settle (if it will) and pour off the clear liquid above it. Never filter solutions containing pyro, hydroquinone, or other developers which oxidize readily, because filtration exposes the solution so freely to the air. If it is necessary to filter, it should be done before the pyro, etc., is added.

The chief impurity from the point of view of compounding developers is dissolved air. Hence it is always best to boil water intended for pyro, and other developers, briskly for a few minutes and to allow it to cool quietly (without shaking). In dissolving the constituents of a developer, the sulphite should be mixed with the water first, then the bromide and other salts, if any, and finally the pyro. This order, be it noted, should be reversed in the case of metol, which should be dissolved first in the water and the sulphite added only when a clear solution has been obtained.

A single solution developer, i. e., one containing alkali ought to have the alkali added last of all.

Two methods of preserving solutions from the action of the air are worth bearing in mind. The first is to store the solution in a lot of small bottles, say 4-ounce capacity, each filled to the lip and well corked. The second is to store the solution in a bottle with the cork at the bottom or fitted with a tap, and to pour a layer of "heavy" paraffin oil on the top of the solution. The oil, although designated heavy, is lighter than water, has no action on any ordinary solution and effectually excludes the air. This method was much used in wet collodion days and is extremely practical in use.

Table Showing the Comparison of the Readings of Thermometers

CELSIUS, OR CENTIGRADE (C). REAUMUR (R). FAHRENHEIT (F).

C.	R.	F.	C.	R.	F.
—30	—24·0	—22·0	23	18·4	73·4
—25	—20·0	—13·0	24	19·2	75·2
—20	—16·0	— 4·0	25	20·0	77·0
—15	—12·0	+ 5·0	26	20·8	78·8
—10	— 8·0	14·0	27	21·6	80·6
— 5	— 4·0	23·0	28	22·4	82·4
— 4	— 3·2	24·8	29	23·2	84·2
— 3	— 2·4	26·6	30	24·0	86·0
— 2	— 1·6	28·4	31	24·8	87·8
— 1	— 0·8	30·2	32	25·6	89·6
Freezing	point of	water.	33	26·4	91·4
			34	27·2	93·2
0	0·0	32·0	35	28·0	95·0
1	0·8	33·8	36	28·8	96·8
2	1·6	35·6	37	29·6	98·6
3	2·4	37·4	38	30·4	100·4
4	3·2	39·2	39	31·2	102·2
5	4·0	41·0	40	32·0	104·0
6	4·8	42·8	41	32·8	105·8
7	5·6	44·6	42	33·6	107·6
8	6·4	46·4	43	34·4	109·4
9	7·2	48·2	44	35·2	111·2
10	8·0	50·0	45	36·0	113·0
11	8·8	51·8	50	40·0	122·0
12	9·6	53·6	55	44·0	131·0
13	10·4	55·4	60	48·0	140·0
14	11·2	57·2	65	52·0	149·0
15	12·0	59·0	70	56·0	158·0
16	12·8	60·8	75	60·0	167·0
17	13·6	62·6	80	64·0	176·0
18	14·4	64·4	85	68·0	185·0
19	15·2	66·2	90	72·0	194·0
20	16·0	68·0	95	76·0	203·0
21	16·8	69·8	100	80·0	212·0
22	17·6	71·6	Boiling	point of	water.

To convert Centigrade into Fahrenheit: Degrees Centigrade $\times 9 \div 5 + 32$. Example: 80°C. $\times 9 \div 5 = 144 + 32 = 176$°F.

To convert Fahrenheit into Centigrade: (Degrees Fahrenheit $-32) \times 5 \div 9$. Example: 100°F. $-32 = 68 \times 5 \div 9 = 37.8$C°.

To convert Réaumur into Fahrenheit: Degrees Réaumur $\times 9 \div 4 + 32$. Example: 16°R. $\times 9 \div 4 = 36 + 32 = 68$°F.

To convert Fahrenheit into Réaumur: (Degrees Fahrenheit $-32) \div 9 \times 4$. Example: 95°F. $-32 = 63 \div 9 \times 4 = 28$°R.

DEVELOPMENT FORMULAS

Pyro. Eastman formula for roll films and film-packs. Prepare two stock solutions. No. 1: Pyrogallic acid, 1 ounce; sulphuric acid, 20 minims; water, 28 ounces. No. 2: Sodium sulphite (desiccated), 3 ounces (or crystals, 6 ounces); sodium carbonate (desiccated), 2 ounces (or crystals, 4 ounces); water, 28 ounces. For use, take No. 1, one ounce; No. 2, one ounce; add water, 8 ounces. Develop at 65° Fahr.

Pyro. Frobisher's formula: Stainless; keeps well; gives brilliant negatives with reasonably correct exposures. I. Water, 12 ounces; sodium sulphite (crystals), 3 ounces (if "dry," 1½ ounces); ammonium bromide, 20 grains; citric acid, 60 grains; sulphurous acid, 1 ounce; pyro, 1 ounce. II. Water, 12 ounces; sodium carbonate (crystals), 4 ounces. For normal exposures take 1 dram each of I and II and add 2 ounces of water.

Pyro. Fairman's dry pyro formula. Dissolve 1 ounce sodium sulphite (crystals) in 3 ounces distilled water at boiling-point. When thoroughly dissolved add water to make solution up to 4 ounces. Keep in well-corked bottle, labeled "Sodium Sulphite, 1–4." Dissolve 1 ounce sodium carbonate (crystals) in 3 ounces hot water, make up to 4 ounces bulk and label this "Sodium Carbonate, 1–4." Dissolve 1 ounce potassium bromide in 9 ounces cold water and, when dissolved, make solution up to 10 ounces. Label this "Potassium Bromide, 1–10." With these, keep on hand an ounce of dry pyro or pyrol, well covered from air or moisture. To develop normal exposures take ½ ounce sulphite solution; dissolve in it 5 grains pyro; add 2 drams carbonate solution, and 5 drops potassium solution. Now add water to make the developing solution up to 5 ounces bulk for wintertime use, or 6 ounces for summer use.

Carbutt's black-and-white developer for use with slow plates in copying documents and printed matter. Water, 15 ounces; sodium carbonate (crystals), ½ ounce; sodium sulphite (crystals), 1 ounce; potassium bromide, 15 grains. Just before use, add 3 grains dry pyro to each ounce of this solution required

for the work in hand. Density comes slowly. When sufficiently dense, immerse the plate in water, 16 ounces; citric acid, 30 grains, after which fix thoroughly in an acid fixing bath.

Pyro-acetone. Bardwell's formula. Prepare three solutions: I. Water, 20 ounces; potassium metabisulphite, 120 grains; pyro, 1 ounce. II. Saturated solution of sodium sulphite. III. Water, 7 ounces; acetone, 1 ounce. For normal exposures mix in the following order and proportions. Water, 1 ounce; No. I, 2 drams; No. II, 2 drams; No. III, 1 ounce.

Metol. Satrapol and Rhodol are identical with Metol. **Wenzel's formula.** *A*. Metol, 30 grains; potassium metabisulphite, 10 grains; potassium bromide, 5 grains; water, 5 ounces. *B*. Sodium sulphite (desiccated), 120 grains (or crystals, 240 grains); sodium carbonate (desiccated), 100 grains (or crystals, 240 grains); water, 5 ounces.

This formula may be quickly prepared by the use of 10 per cent solutions; or by hydrometer, by substituting 5 ounces of a 10 per cent solution of sodium sulphite crystals (hydrometer, 28), for 5 ounces of water in solution *A*, and using, instead of solution *B*, 5 ounces of a 10 per cent solution of sodium carbonate crystals (hydrometer, 23).

A and *B* combined form a one-solution developer for normal exposures. For use as a two-solution developer for normal exposures take equal parts of *A* and *B*. For under-exposures take of *A* 1 part, *B* 1 part, and water 1 to 2 parts, according to the assumed degree of under-exposure. For over-exposures take of *A* 2 parts, *B* 1 part, and add 10 per cent solution of potassium bromide as required.

Metol-Hydro. Wenzel's formula. *A*. Metol, 10 grains; hydroquinone, 20 grains; potassium metabisulphite, 10 grains; potassium bromide, 5 grains; water, 5 ounces. *B*. Sodium sulphite, desiccated, 120 grains (or crystals, 240 grains); sodium carbonate, (desiccated), 100 grains (or crystals, 240 grains); water, 5 ounces.

A and *B* combined in equal parts form an excellent

one-solution developer for normal exposures. For under-exposures take *A*, 1 part; *B*, 1 part, and add water, 1 to 2 parts, according to degree of under-exposure. For over-exposure, take *A*, 2 parts; *B*, 1 part, and add a few drops of a 10 per cent potassium bromide solution.

Metol-Adurol for tank development. Prepare a stock solution as follows: Water, 4 ounces; sodium sulphite (anhydrous), 300 grains; potassium bromide, 15 grains; adurol, 105 grains; metol, 15 grains; potassium carbonate, 750 grains. Each ounce of this stock solution is diluted for use with 16 ounces of water; development time, 25 minutes, at 65° Fahr.

Metol-Pyro. Prepare two solutions, as follows: *A*, Metol 10 grains; pyro, 20 grains; potassium metabisulphite, 10 grains; potassium bromide, 5 grains; water, 5 ounces. *B*. Sodium sulphite (desiccated) 120 grains (or crystals, 240 grains); sodium carbonate (desiccated), 50 grains (or crystals, 120 grains); water, 5 ounces.

Solution *A* will keep for months if properly bottled and tightly corked. The above may be quickly prepared as follows: Substitute 5 ounces of a 10 per cent solution of sodium sulphite crystals (hydrometer, 28) for 5 ounces of water in solution *A*, and use 2½ ounces of a 10 per cent solution of sodium carbonate crystals (hydrometer, 23) plus 2½ ounces of water, instead of solution *B* as given above. *A* and *B* combined form a one-solution developer for normal exposures.

Ortol. For normal use with plates prepare the subjoined two solutions: *A*. Ortol, 30 grains; potassium metabisulphite, 10 grains; potassium bromide, 5 grains; water, 5 ounces. *B*. sodium sulphite (desiccated), 120 grains (or crystals, 240 grains); potassium carbonate, 60 grains, water 5 ounces. Equal parts of *A* and *B* for normal exposures. For tank development, time 30 minutes, at 65° Fahr., the following is excellent: Ortol, 10 grains; potassium metabisulphite, 5 grains; sodium sulphite, 65 grains; sodium carbonate, 65 grains; water, to 20 ounces.

Ortol-Metol. Prepare two solutions as follows: *A*. Ortol, 20 grains; metol, 10 grains; potassium metabisulphite, 10 grains; potassium bromide, 5 grains; water, 5 ounces. *B*. Sodium sulphite (desiccated), 120 grains (or crystals, 240 grains); potassium carbonate, 60 grains; water, 5 ounces. For normal exposures, take equal parts *A* and *B*.

Edinol-Hydro for plates and films. Stock solution: Water, 64 ounces; acetone sulphite, 2 ounces; edinol, 1 ounce; sodium sulphite (dry), 6 ounces; hydroquinone, 1 ounce; potassium bromide, ¼ ounce; potassium carbonate, 12 ounces. For use, take stock solution, 1 ounce; water, 4 to 12 ounces, according to the exposure or character of negative desired. This developer keeps well, is stainless, does not injure the hands, and is invaluable for under-exposure.—F. E. D. Brown.

Edinol-Hydro for development-papers. Prepare stock solution as follows: Warm water, 10 ounces; acetone sulphite Bayers, 300 grains; sodium sulphite (crystals), 60 grains; edinol, 30 grains; hydroquinone, 15 grains; potassium bromide, 10 grains; sodium carbonate, 550 grains. For use, take 1 ounce of the above and dilute with 4 ounces water.

M-Q developer for gaslight papers. Water, 20 ounces; metol or elon, 15 grains; hydroquinone, 60 grains; sodium sulphite (desiccated), 220 grains; sodium carbonate (desiccated), 400 grains. Dissolve in order given and add 80 drops of 10 per cent potassium bromide solution. Store in full bottles, well corked. For Regular Velox use at full strength; for Special Velox, Azo, Argo and Cyko dilute with equal parts of water. Use bath at 65° Fahr.

Duratol. Make stock solution as follows: Dissolve 15 grains Duratol in 20 ounces of hot water. Mix (dry) 1 ounce sodium sulphite (dry) with 2 ounces sodium carbonate (dry), and add the mixture to the Duratol solution with frequent stirring. When thoroughly dissolved, add 75 grains hydroquinone and, finally, add water to make the solution to 40 ounces in bulk. Used as a normal developer for plates or films, this gives com-

plete development in 5 to 8 minutes. For tank development, at 65° Fahr., take 1 part stock solution and 1 part water for 15 minutes development; or 1 part stock solution and 2 parts water for 22 minutes development: or 1 part stock solution and 3 parts water for 30 minutes development.

Rodinal. (Citol is identical in composition.) A concentrated developer which simply needs dilution with water for use. For plates and films: Normal exposures, Rodinal, 1 part; water, 20 parts. Over-exposure, Rodinal, 1 part; water, 10 to 20 parts. Under-exposure, Rodinal, 1 part; water, 20 to 40 parts. Develop at 60° Fahr. When used in strong solutions, as Rodinal, 1 part; water, 10 parts, the addition of bromide of potassium is advised. Strong solutions produce contrast; dilute solutions give softness. With uncertain exposures, begin development with Rodinal, 1 part; water, 30 parts, later adding a few drops at a time of Rodinal, 1 ounce; potassium bromide (crystals), 1/3 ounce; water, 1 ounce. Negatives developed with Rodinal lose density in the fixing bath, hence development should be carried further than is required with some other developers.

For development papers, use Rodinal, 1 part; water, 15 to 20 parts, adding 3 drops of a 10 per cent solution of potassium bromide to each ounce of the developing solution.

For bromide papers, use Rodinal, 1 part; water, 50 to 100 parts, as needed. For lantern-slides, use Rodinal, 1 part; water, 30 parts, without bromide.

Amidol. (Nerol is identical in composition): A concentrated developer may be prepared as follows: Water, 13 ounces; sodium sulphite, (crystals), 2 1/2 ounces; when thoroughly dissolved add amidol or nerol, 1/4 ounce. This solution will keep fairly well in bottles completely full and well corked. For use, take 1 ounce of the concentrated solution and dilute with 3 or 4 ounces of water. Another method is to prepare a solution of 1 1/4 ounces of sodium sulphite in 25 ounces of water, and just before use add 3 grains of amidol or nerol (dry) to each 1 1/4 ounces of the sulphite solution required for development. In case of over-exposure add

40 to 60 drops of a 10 per cent solution of potassium bromide to each ounce of developer. A saturated solution of potassium carbonate, added drop by drop to the developer, greatly accelerates the progress of development, which should be pushed further than with pyro-soda, as the image loses strength in the fixing bath.

This last method, without the addition of potassium carbonate, is recommended for gaslight papers. Without bromide it gives blue-black tones; with bromide it gives olive-black tones.

For bromide papers use: Water, 40 ounces; sodium sulphite, 1 ounce; citric acid, 20 grains; potassium bromide, 15 grains. Just before use add 3 grains amidol to each ounce of stock sulphite solution required for the work in hand. As a rule, however, the maker's formulas are advised for commercial bromide papers.

Eikonogen. A good single solution developer is made up as follows: Sodium sulphite (crystals), 3 ounces; potassium carbonate, 1¼ ounces; eikonogen, ¾ ounce; boiling water, 25 ounces. Solution is hastened by stirring with a glass rod, or shaking, and the mixture is preferably bottled in 5-ounce bottles, and tightly corked as quickly as possible after preparation. For normal exposures this developer may be used undiluted; but where over-exposure is known, old, used developer is preferred, strengthened as development proceeds with fresh solution and a few drops of bromide solution. Bromide has a more marked action with eikonogen than with some other developers, and should be used with caution until its effects are understood by experience.

Eiko-Hydro (Heckroth). No. 1. Water, 16 ounces; sulphite of soda, (crystals), 1 ounce; dissolve and make *just* acid by adding a few drops of sulphuric acid until the solution will turn blue litmus paper red: then add hydroquinone, 80 grains; eikonogen, 80 grains. No. 2. Water, 16 ounces; sulphite of soda (crystals), ½ ounce; carbonate of potash, 2 ounces. For normal exposures, take of No. 1, 3 ounces; of No. 2, 2 ounces; and add water, 1 ounce. Do not add the water during the winter months, but instead add 8 drops of a 10 per cent solution of potassium bromide.

Glycin. Prepare two solutions. No. 1. Hot water, 10 ounces; add in the order given sulphite of soda (crystals), 1¼ ounces; carbonate, ¼ ounce; glycin, ½ ounce. No. 2. Water, 10 ounces; carbonate of potash, 1¼ ounces. For normal exposures take of No. 1, 1 ounce; No. 2, 2 ounces; and add 10 ounces of water. For tank development the following formula is recommended, used at a temperature of 65° Fahr. Water, 32 ounces; sulphite of soda (crystals), 30 grains; potassium carbonate, ½ ounce; glycin (or glycine), 28 grains; potassium bromide, 10 per cent solution, 5 to 10 drops. In this solution normal exposures will be fully developed in 30 to 40 minutes; over-exposures in 15 to 20 minutes. Development should be carried to greater density than is really desired, as the density decreases in the fixing bath. The negatives given with glycin are of a warm black color, and possess a good range of gradation with clear shadows.

Wallace's Time and Temperature Method with Pyro, for Developing Batches of Plates in a large tray. Prepare stock solutions: *A*. Water, 24 ounces; sodium carbonate (dry), 1 ounce (or crystals, 2 ounces). *B*. Water, 9 ounces; oxalic acid, 12 grains; pyro, 1 ounce. Use only boiled or distilled water in making these stock solutions. For normal exposures, with temperatures below 68° Fahr. (20° Cent.), mix *A*, 6 ounces; *B*, ½ ounce. With temperatures higher than 68° Fahr. dilute this mixture with an equal bulk of water. To use the table given below be careful to have all the solutions at an equal temperature. Knowing what this temperature is, find the degree of temperature in the first or second column at the left-hand side of the table (accordingly as the Fahrenheit or Centigrade thermometer is used), and at the intersection of the horizontal line with the vertical line leading to the contrast factor desired will be found in minutes and seconds the length of time to develop at this temperature. To illustrate: Suppose we are using a factor of 6 as giving us the desired range of contrasts, and that the temperature is 23° Cent. (73° Fahr.). At the intersection of the lines 23 and 6 will be found the figures 2 and 55, indicating

the time of development as 2 minutes and 55 seconds. Similarly, if the temperature is 20° Cent. (68° Fahr.), and the factor 5 gives us the required range of contrasts, at the intersection of the two lines 20 and 5 will be found the figures 3 and 10, indicating that the time of development should be 3 minutes and 10 seconds. This is all we need to know. The plates are immersed in the developing solution, covered with a tray, and at the end of the indicated time are taken out of the developer, rinsed under the tap and placed in the fixing solution.

With regard to the choice of the contrast factor among those given in black-faced figures at the head of the table, this must be determined by the personal preference of the individual as to the general character of the negative desired. Naturally this preference will be considerably influenced by the amount of contrast in the subject, this depending on the character of the subject and its illumination. In a normal subject such as a sunlit landscape, or street scenes, portraits out-of-doors, etc., where the range of contrast is fairly large, softness will be gained by choosing a low contrast factor, and crispness with a decided relief can be secured by the choice of somewhat higher factor In portraiture, where the range of contrast is often small and softness is generally desirable, a low contrast factor is usually necessary. Contrariwise, in photographs of carvings in bas-relief, where the contrasts in the subject usually require emphasis, a somewhat higher contrast factor should be chosen. As a factor for general use, 5 will usually give a normal negative at 65° Fahr.

This method offers remarkable convenience for professionals and others having large batches of plates to develop at one time. Temperature is the all-important factor in this method. Trays, solutions, darkroom and all water used must be kept at the same temperature to insure uniform results. Do not use water from the tap. Store a supply for use in the room a few hours beforehand.

A method useful to amateurs using the favorite M-Q developer is given on the following pages.

Time and Temperature Table for Use with the Wallace Method of Development with Pyro, the Time Being Given in Minutes and Seconds.

Temp. F.	C.	CONTRAST FACTORS 4	4½	5	5½	6	6½	7	8	9	10	11	12	13
59°	15°	3 min. 55 sec.	4 25	4 55	5 25	5 55	6 25	6 55	7 50	8 50	9 50	10 50	11 50	12 50
60°	16°	3 30	4	4 25	4 50	5 20	5 45	6 10	7 05	7 55	8 50	9 45	10 35	11 30
62°	17°	3 15	3 40	4 05	4 30	4 55	5 20	5 45	6 30	7 20	8 10	9	9 50	10 40
64°	18°	3	3 20	3 45	4 05	4 30	4 50	5 15	6	6 45	7 30	8 15	9	9 45
66°	19°	2 45	3 05	3 25	3 45	4 05	4 25	4 45	5 30	6 10	6 50	7 30	8 10	8 55
68°	20°	2 30	2 50	3 10	3 30	3 50	4 05	4 25	5 05	5 40	6 20	7	7 35	8 15
70°	21°	2 20	2 35	2 55	3 10	3 30	3 45	4 05	4 40	5 15	5 50	6 25	7	7 35
72°	22°	2 10	2 25	2 40	2 55	3 10	3 25	3 45	4 15	4 50	5 20	5 50	6 25	6 55
73°	23°	2	2 10	2 25	2 40	2 55	3 10	3 25	3 50	4 20	4 50	5 20	5 50	6 15
75°	24°	1 50	2	2 15	2 25	2 40	2 55	3 10	3 35	4 05	4 30	4 55	5 25	5 50
77°	25°	1 40	1 50	2 05	2 15	2 30	2 40	2 55	3 20	3 45	4 10	4 35	5	5 25

Wallace's Universal M-Q Developer. Dissolve sodium sulphite (dry), 4 ounces; sodium carbonate (dry), 6 ounces; in 100 ounces warm water. When dissolved, add metol, ¼ ounce; hydroquinone, ¾ ounce, adding water to bring the bulk of the solution up to 120 ounces.

This forms the stock solution and may be stored in well-stoppered bottles convenient for use.

For normal use as a developer for plates, singly or in batches in a tray, dilute any desired quantity of the stock solution with an equal bulk of water. The annexed table indicates the time of development required at different temperatures for various contrast factors given in black letters at the head of the table, this use constituting a "time and temperature" method of great utility and convenience. The choice of contrast factor lies with the reader. As a guide factor No 5, the result of development for 3½ minutes at 66° Fahr. gives a negative of correct density for printing on special Velox paper. Factor No. 7 would be suited for platinum printing.

To use this formula for tank development: First, reduce to seconds the time of development desired. Second, reduce to seconds the time which the table shows will give the desired contrast with the full strength solution. Third, divide the first figure by the second and the resulting figure will give the dilution required for the prolonged development. Example: It is desired to use the formula for twenty minutes' development: 20 minutes = 1,200 seconds. The factor chosen is four and temperature 68° Fahr., at which the time of normal development is indicated in the table as 2 minutes and 30 seconds=150 seconds. Dividing 1,200 by 150, we get 8, indicating that for tank development, giving the desired contrast in twenty minutes, we must take one part of stock solution developer and add seven parts of water. In order to avoid stain, the entire bulk of dilute developer used should contain 20 grains sodium sulphite per ounce of solution. To insure this, add 20 grains of sulphite to each ounce of water added to the stock solution. Do not use at a temperature higher than 65° Fahr.

In using the formula for the development of development or gaslight papers, use the stock solution at its full strength for regular papers, and use equal parts of stock solution and water for special papers. To insure clear whites in the prints, add one drop or more of a 10 per cent solution of potassium bromide to each ounce of the stock solution used. To save trouble, we

may add 15 grains of potassium bromide to the stock solution when made up in the quantities called for in the formula given. This is sufficient to keep the whites clear in prints, and does not affect the speed of plates, though it will slow development a little.

Time and Temperature Table for use with Wallace's Metol-Hydroquinone Formula. The Time of Development is Expressed in Minutes and Seconds.

Temp.		CONTRAST FACTORS									
Fahr.	Cent	1	2	3	4	5	6	7	8	9	10
78	26	Min. Sec.	1 12	1 30	1 48	2 06	2 24	2 42	3	3 18	3 36
75	24	1	1 20	1 40	2	2 20	2 40	3	3 20	3 40	4
73	23	1 06	1 28	1 50	2 12	2 34	2 56	3 18	3 40	4 02	4 24
71	22	1 12	1 36	2	2 24	2 48	3 12	3 36	4	4 24	4 48
69	21	1 18	1 44	2 10	2 36	3 02	3 28	3 54	4 20	4 46	5 12
68	20	1 24	1 52	2 20	2 48	3 16	3 44	4 12	4 40	5 08	5 36
66	19	1 30	2	2 30	3	3 30	4	4 30	5	5 30	6
64	18	1 36	2 08	2 40	3 12	3 44	4 16	4 48	5 20	5 52	6 24
62	17	1 42	2 16	2 50	3 24	3 58	4 32	5 06	5 40	6 14	6 48
60	16	1 54	2 32	3 10	3 48	4 26	5 04	5 42	6 20	6 58	7 36
50	15	2 06	2 48	3 30	4 12	4 54	5 36	6 18	7	7 42	8 24

INTENSIFICATION AND REDUCTION

Whiting's Mercury Intensifier. Prepare the following solution: Bromide of potassium, 30 grains; perchloride of mercury, 2 drams; hydrochloric acid (exactly), 10 minims; distilled water, 10 ounces. Dissolve the bromide in the water first, then add the mercury and finally the acid. Follow this formula exactly; filter the solution and label it "Mercuric Intensifier: Poison."

Wash the negative thoroughly; place it in a porcelain dish and work in artificial light only. Working in daylight may give fogged or veiled negatives.

For intensification of shadows in greater proportion than high lights, pour on the fluid and stop action *immediately* the surface begins to whiten, and plunge under the tap. To increase in equal proportion, continue until the half-tones are bleached at the *back* of the plate or film, but the high lights still left black. To increase strongly the contrasts of the whole negative, bleach all parts through. Note that, if a negative has a thin fog from the action of light before intensifying, it will be best to bleach through all parts.

Rock the dish constantly during bleaching, wash under the tap most thoroughly, and pass a tuft of absorbent cotton over the film once or twice to remove any insoluble mercurial compound.

The negative can now be blackened by immersion in a one-in-four ammonia solution, i. e., 1 part ammonia .880 to 4 parts of water; but if only slight intensification is desired, use a 10 per cent solution of sodium sulphite.

Mercuric Chloride. Make up a stock solution of mercuric chloride by powdering 1 ounce of mercuric chloride and dissolving it in 15 ounces of hot water. When the solution has cooled, there should be a deposit of white, feathery crystals at the bottom of the bottle. Pour off the clear liquid into a clean bottle and add 2 or 3 drops of hydrochloric acid per ounce of solution. As this stock solution is extremely poisonous, label plainly and handle with care; it will keep indefinitely and may be used repeatedly.

To intensify, the well-fixed and washed negative should be immersed in the mercury solution and gently rocked until the image is completely bleached or whitened through the film, as seen by examination at the back. It is then washed in running water for at least half an hour to completely eliminate all traces of mercuric chloride from the film. The success of the after-treatment depends on the thoroughness of this washing in all methods where mercury is used.

To reblacken the bleached image, we have choice among several methods, differing in the amount of intensification given.

1. A dilute solution of ammonia prepared by adding 15 drops of stronger ammonia water .880 per ounce of water. This gives vigorous intensification, but the action is uncertain, stains are liable to occur and the results are rarely permanent.

2. A 10 per cent solution of sodium sulphite. This gives permanent results, but the degree of intensification is slight and not proportionate throughout the scale of gradation in the negative. Practically it intensifies the stronger portions of the negative, while weakening the shadow detail and leaving the half-tones unchanged.

3. A 5 per cent solution of acetone sulphite gives proportionate intensification of the normal gradation of the negative and is slightly more energetic in its action than sodium sulphite.

4. Ferrous oxalate redevelopment,—the best of all mercurial methods. In this method, the negative is soaked in the mercury solution until very nearly bleached through, then washed for an hour. Then take, for each negative so bleached, 1½ ounces of a saturated solution of potassium oxalate, add to it ¼ ounce of a saturated solution of ferrous sulphate, and apply to the bleached plate until it is thoroughly blackened. Wash as usual.

5. Schippe's Salts, from 10 to 20 grains per ounce of water, freshly prepared.

6. Redevelopment with metol (Harris' formula): *A:* Metol, 5 grains; sodium sulphite (crystals), 45 grains; potassium bromide, ¾ grain; water, 1 ounce. *B.* Sodium carbonate, 4½ grains; water, 1 ounce. Use three parts of *A* to 1 of *B*.

Mercuric Bromide. Gmeiner's method is as follows: Bleach the well-washed negative in: Mercuric chloride, 1 dram; potassium bromide, 1 dram; water, 25 drams, at least sufficient water to thoroughly dissolve the salts. After bleaching, wash the plate for 15 minutes in running water, and darken in a solution made up in the subjoined proportions: Hydroquinone, ½ grain; sodium sulphite, 2 grains; potassium bromide, 1 grain; potassium carbonate, 1 grain; water to make 1 ounce. Pour this into a tray, and slide the negative quickly into it. When the bleached plate has somewhat darkened, pour off the solution into a graduate, and add an equal quantity of new developer to it, omitting the bromide. Take the plate from the tray, pour in the developer, immerse the negative, and rock the plate until density is acquired. When intensification is complete, the negative needs only to be washed and dried, after which the whole process may be repeated if desirable.

Mercuric Iodide. Lumière's original formula for this favorite intensifier read: Mercuric iodide, 4½ grains; sodium sulphite, 44 grains; water, 1 ounce. "Phos," in *Photography*, claims the following as better: Mercuric iodide, 10 grains; sodium sulphite, 200 grains; water, 10 ounces.

The negative is immersed in the intensifier till it gains the required density. It should then be washed in several changes of water and placed in any alkaline developer for about the time required to develop a negative, say from seven to eight minutes. It is advisable to conduct the development by time, as frequently there is little or no visible change, and the stability of the intensified negative depends upon thorough development. No fixation is required, but it is essential that a thorough washing should be given.

Wellington's New Silver Intensifier for plates. Soak the negative for 5 minutes in a 10 per cent formalin solution, to harden the film. Rinse in water for a few minutes and immerse for 1 minute only in water, 20 ounces; potassium bichromate, 1 grain; potassium bromide, 20 grains; hydrochloric acid, 60 minims. Rinse in water for a few minutes after which the plate

is ready for intensifying solution prepared as follows: *A*. Silver nitrate, 800 grains; distilled water to make solution up to 20 ounces. *B*. Potassium sulphocyanide, 1,400 grains; sodium hyposulphite, 1,400 grains; water to make solution up to 20 ounces. These solutions, once prepared, will keep for years. For use, ½ ounce of *A* is taken, and ½ ounce of *B* is added with vigorous stirring with glass rod. To this is added 1 dram of a 10 per cent solution of pyro preserved with sodium sulphite, and 2 drams of a 10 per cent ammonia solution. The negative is laid face up in a clean porcelain dish, and the silver solution poured over it. Wash well when sufficiently intensified.

Uranium Intensifier. Prepare two solutions. *A*. Water, 4 ounces; uranium nitrate, 32 grains. *B*. Water, 4 ounces; potassium ferricyanide, 32 grains. For use, take equal parts of *A* and *B*, adding 2 drams glacial acetic acid to each ounce of the combined solution. The negative to be intensified is immersed in this solution after well soaking in running water for half an hour. When sufficiently intensified, wash well and dry as usual.—L. H. Breason.

Chromium Intensifier. The chromate solution is prepared as follows: Water, 2 ounces; potassium chromate, 10 grains; hydrochloric acid (conc.), 5 drops. This solution will keep indefinitely.

The negative to be intensified should first be freed from all traces of hypo by thorough washing. In very warm weather the film may be hardened by immersion in a weak (5 per cent) solution of formalin, as a precautionary measure. It is then immersed in the chromate solution, where it will be found to assume a bright yellow color within a few minutes. For a medium amount of intensification, two minutes' immersion in the chromate bath will be sufficient. The solution is then poured off (and can be reserved for future use), and the plate is allowed to wash in running water for about three minutes. It is then immersed in a mixture of equal parts of the following developer: *A*. Hydrokinone, 20 grains; potassium metabisulphite, 20 grains; water, 5 ounces. *B*. Caustic soda, 40 grains; water, 5

ounces. Although I strongly recommend this particular developer, its use is not essential. Any good metol-hydrokinone or hydrokinone formula may be successfully used. Redevelopment takes place very quickly, so that we can remove the negative after a few minutes and give it a final washing in running water.

Ferricyanide Reducer. Dissolve 50 grains potassium ferricyanide in 1 ounce of water. Dilute 1 ounce of ordinary plain hypo solution (hypo, 1 oz.; water 4 ozs.) with 1 ounce of water. To this, immediately before use, add 30 minims of the ferricyanide solution and pour over the negative to be reduced, rocking the tray. The action is very rapid and must be closely watched. When the reduction is sufficient, remove the negative and wash well, drying as usual.

Glycerinated Farmer's Reducer, for local reduction with a separate camel's-hair brush for each solution. Use solution *A* for the parts needing reduction, then, when sufficiently reduced, soften the edges or margins of the reduced portions with solution *B*.

Prepare the following *Stock Solutions:* No. 1. Ferricyanide of potassium, ½ ounce; hot water, 1¼ ounces. Dissolve and add glycerine to make 5 fluid ounces. No. 2: Hyposulphite of soda, 1 ounce; hot water, 2 ounces. Dissolve and add glycerine to make 10 fluid ounces. These solutions must not be used until cold. To make the "*A*" solution referred to above, mix 1 part of Stock Solution No. 1 with 2 parts of Stock Solution No. 2. For the "B" solution, mix 1 part of No. 1 with 9 parts of No. 2.

Persulphate Reducer. Dissolve 30 grains ammonium persulphate in 4 ounces of water. Dissolve 20 grains sodium sulphite (crystals) in 2 ounces of water. The negative to be reduced, wet or dry, is first placed in a tray and 2 ounces of the persulphate solution poured over it and the dish is rocked. The density of the negative will visibly change in from 2 to 4 minutes. If not sufficiently reduced in 4 minutes, throw off the persulphate solution, rinse the negative in water, and apply the remaining 2 ounces. When sufficiently reduced, rinse in water and immerse the negative in the

sodium sulphite solution for a few minutes. Wash and dry as usual.

Ceric Sulphate (Lumière). The action of this reducer is similar to that of Farmer, but it does not stain and it keeps indefinitely. It is prepared as follows: Add strong sulphuric acid, 20 minims, to water, 2 ounces; dissolve ceric sulphate, 440 grains, in this and add water to make up to 10 ounces. This is practically a 10 per cent solution. For use take ¼ ounce of this stock solution and dilute with 2 ounces water. Ceric sulphate acid solution can sometimes be bought ready for use. For very dense negatives a stronger solution can be employed. When sufficiently reduced, the negative should be well washed.

Mechanical Reduction. In the hands of a skillful worker, alcohol rubbed locally on any desired portion of a negative, with a piece of soft chamois leather over the tip of a finger, or with a little cotton covering the blunt end of a match, will give effective reduction of density. The size and shape of the rubbing tool and the dexterity of the worker determine the effectiveness of this method. While working, the negative must be held against a window or other transparent support, so that the progress of the reduction can be watched. A retouching frame is good for this purpose.

Halation and broad patches of density may be reduced with alcohol and erasing powder, for which the following is a good formula: Mix finely prepared chalk, 20 parts; powdered silicate of magnesium, 5 parts; powdered sugar of milk, 2 parts; extra finely powdered quillia, 5 parts. Thoroughly triturate these ingredients in a mortar and pass through a fine sieve before using. Apply to the negative with a tuft of absorbent cotton, with a careful, even friction. It will be safest for the novice to use alcohol alone, as the frictional powder goes rapidly through the film and needs considerable experience in using. Smaller patches, especially of a lineal or specifically shaped character, are best reduced with a guttapercha pencil (the soft material used by dentists) of rather soft degree, used in conjunction with the reducing medium.

WORKROOM FORMULAS

To Fireproof Fabrics for flashbags, flashlight curtains, etc. Dissolve ammonium phosphate, 5 ounces; common soap, 2 ounces; in water, 90 ounces. Soak the fabric in this mixture for half an hour at 120° Fahr. and hang up to dry. Well wash the fabric, and repeat the fire-proofing after every four or five exposures. Another formula is water, 1 gallon; ammonium phosphate, 16 ounces; borax, 2 ounces. The bags should be soaked in this for half an hour, then wring out and hang up to dry; repeat the soaking every month or two.

Ink for Writing on Glass Bottles: Dissolve 4 drams shellac (unbleached) in 4 ounces alcohol (95 degrees). Dissolve also 7 drams borax in 6 ounces of water. Pour the first solution slowly into second, stirring constantly till well incorporated. Then add 12 grains of aniline, any color desired. The glass may be cleaned without fear of obliteration of inscriptions.

Substratum for Coloring Photographs. Beat the white of one egg to a froth and set aside for twelve hours, after which filter the solution through a piece of clean muslin. Now add 4 grains of common salt; 4 grains of powdered gum arabic; 2 grains quinine sulphate, and water to make the solution to 2 ounces. Paint this freely over the surface of the print to be colored, and blot off the excess with fluffless blotting. A little of this solution should also be mixed with the water-colors or dyes used in coloring the print.

Another substratum, much used, is: Purified ox-gall paste, 60 grains; distilled water, 16 ounces; alcohol, 4 ounces. Apply with a camel's-hair brush in a thin even coating and let dry before proceeding to color the print.

Another formula is: Colorless gum arabic, 1 ounce; white sugar, ½ ounce; alcohol, ½ ounce; alum, 50 grains; water, 10 ounces. When thoroughly dissolved, filter and bottle for use.

Transferring Prints to Glass, Wood, etc. Mix Canada balsam or dammar varnish with an equal amount of turpentine oil, coat the sheet of glass (or wooden surface) with an even coating and let dry until

the surface is just tacky, usually about five hours. Soak the print to be transferred for 10 minutes in a 5 per cent formalin bath to harden the film; then immerse it in water for a few minutes. Remove excess of water from face of print with fluffless blotter, and lay it, face down, upon the prepared glass or wood. Using a soft squeegee, from the center of the print press it into perfect contact with the varnished surface, carefully pressing out all air-bubbles. After drying for twenty-four hours, wet the finger tips and rub away the paper backing of the print, so that only the film of the print remains on the prepared glass or wood surface. When all the paper has been removed, allow to dry and then give one coat clear varnish.

Starch Mountant. Mix starch powder with sufficient cold water to the consistency of cream; slowly add boiling water to this, with constant stirring until the starch has thickened up to a paste and becomes almost clear. The jelly thus formed should be strained through two thicknesses of muslin. Add a few drops of carbolic acid, as preservative. Starch mountants should always be freshly made for use.

Dextrine Mountant. Mix 1 ounce of dextrine with 2 ounces warm water; and ¼ ounce powdered starch with 1 ounce of cold water; getting a smooth mixture in each case. Mix the two with vigorous stirring, place the vessel containing the mixture in a pan of water, and boil with stirring until the whole thickens to a fluid paste. Stir in 10 drops of a 10 per cent solution of thymol in alcohol, and strain the mixture through fine muslin into a jar or wide-mouthed bottle for use.

Mounting Prints on Cloth is generally done by squeegeeing the prints on to a ferrotype plate (or sheet of waxed glass), and pasting on the linen or muslin to the back of the print while it is damp. When dry, the prints are stripped as usual and trimmed on three sides, the strip on the untrimmed end serving as a hinge if the prints are afterward bound together to form a book.

To Prevent Squeegeed Prints From Sticking to ferrotype or glass plates, smear the plate with a few

drops of wax solution and polish the surface of the plate with a dry cloth. To make the wax solution, dissolve a piece of white or yellow wax, about the size of a walnut, in 10 ounces of benzine. This, bottled, will serve for years.

Another plan, which does away with the waxing, is to soak the prints for a few moments in a bath of 1 ounce formalin to 9 ounces of water before squeegeeing them to the ferrotype or glass plate.

Fixative for pastel, crayon and pencil work on photographic base. (Arthur Whiting.) Dissolve mastic, 24 grains, in amyl acetate, 3 ounces, by agitation, and allow to stand some hours before use. Next, dissolve celluloid, 7 grains, in amyl acetate, 3 ounces, by agitation, and allow to stand. When No. 1 solution is clear, add No. 2 to it, and keep for use in a tightly corked, short-necked bottle. Apply to the finished enlargement with a spray diffuser or an atomizer, directing the spray up and down and across the print rapidly, at a distance of about 15 inches.

A Flexible Background, which can be rolled up and handled roughly without showing cracks or creases, is made as follows: Prepare the stretched sheeting or canvas with a coat of sizing, as usual. Dissolve a bar of ordinary yellow soap (shaved) in half a pint of water by boiling. Add half an ounce of glycerine and a pound of the desired pigment, with continual stirring, until a smooth paint is secured.

Ground-glass or Matt Varnish. A reliable formula is as follows: Gum sandarac, 4 drams; gum mastic, 1 dram; ether, s.p. 720, 5½ ounces. Powder the gums and dissolve in the ether; and, when dissolved, add ¼ ounce to 1½ ounces of pure benzole (benzene), according to the coarseness of the grain required. The more benzene used, the coarser the matt or grain and the more opaque it becomes. This varnish dries very quickly, and, whilst still damp, the worker must quickly knife away the parts desired to be left clear, as it dries hard and is difficult to remove afterward. It can be stained so as to produce a more non-actinic medium by adding a little powdered gamboge or iodine.

Retouching Dope. One quarter teaspoonful of powdered resin, dissolved in 2 ounces of turpentine and filtered when dissolved. If too thick, add turpentine; if too thin, leave the bottle uncorked, when the dope will thicken by evaporation.

Negative Varnish. Gum sandarac, 1 ounce; gum shellac, 2 ounces; alcohol (denatured), 20 ounces. When dissolved, filter, and it is ready for use. The negative should be warmed before the varnish is applied.

Dead Black Varnish. Alcohol, 8 ounces; lamp-black, 2 ounces; shellac, 1 ounce. Decant and filter.

Varnishes for Prints. Sandarac, 1 ounce; benzol, 4 ounces; acetone, 4 ounces; absolute alcohol, 2 ounces. Allow to stand, with occasional agitation, until thoroughly dissolved. When clear, filter through fine muslin. Apply with camel's-hair brush in light strokes, to secure thin, even coating, and dry the prints away from all dust.

Borax, 150 grains; white shellac, 300 grains; sodium carbonate, 50 grains; glycerine, 150 minims; water, 5 ounces. Boil, allow to get cold, stir in alcohol, 5 ounces. Add pumice powder, to throw down any sediment, shake well, let stand 24 hours, and filter through fine muslin.

PRINTING PROCESSES

Development Prints on Drawing-papers. Beat the whites of two eggs to a fine froth, adding three drops glacial acetic acid and one ounce of water. Let this subside and filter through two folds of clean muslin, after which let it stand 24 hours.

Prepare a Sizing Solution by rubbing up two ounces of arrowroot in a few ounces of water to form a thickish cream, free from any lumpiness. Add water up to 25 ounces with constant stirring and boil for a few minutes in an agate pan. When cooled, remove the scum and beat the solution well with a wooden spoon, adding the albumen solution previously prepared as above.

Pin the drawing-paper (of good quality, such as Whiting's *Angora* or Whatman's smooth "hot pressed")

on a clean board, and lightly rub the sizing mixture into the paper with a soft sponge or wad of cotton, applying the sizing liberally and using a circular motion. When dry, the paper will have a pleasing, ivory-like finish.

Prepare a Salting Solution by dissolving 20 grains gelatine in 10 ounces of hot water. When cold, add iodide of potassium, 60 grains; bromide of potassium, 20 grains; chloride of ammonium, 10 grains. Float the sized paper on this for fully two minutes and suspend to dry.

Prepare the Sensitizing Solution by dissolving 200 grains silver nitrate in 5 ounces distilled water, adding 50 minims glacial acetic acid. Apply this, in artificial (yellow) light to the sized and salted paper with a pad of cotton or clean soft sponge, using care to get an even coating thoroughly covering the sheet of paper used. This is dried in the dark or away from daylight, being sensitive to light action.

Paper so prepared will yield a print by contact with an average negative with five seconds exposure to diffused daylight. If used while still wet (right after sensitizing) for the making of enlargements, an exposure of two minutes is sufficient with Welsbach gaslight or incandescent electric light. The image is invisible until developed. A suitable developer is as follows: water, 16 ounces; pyro, 40 grains; sulphuric acid, 20 drops. Apply this with a Buckle's brush, lightly passing it over the image with quick strokes. Wash thoroughly after development and fix in an acid fixing bath, such as is usually employed for development papers.

Fabrics. To make prints on fine linen or silk, first wash the fabric in clean warm water, and dry as flat as possible, by stretching it over a sheet of clean glass. Prepare the following *salting* solution: common salt, 100 grains; ammonium chloride, 25 grains; magnesium lactate, 125 grains; hard gelatine, 125 grains; distilled water, 25 ounces. First allow the gelatine to soak in part of the water for half an hour; then dissolve completely by gentle heat and add the salts. When thorough solution is obtained, soak the fabric in the solution for a few minutes and suspend so as to dry

without wrinkles. Prepare the sensitizing solutions as follows: No. 1. Nitrate of silver, 120 grains; distilled water, 4 ounces. No. 2. Citric acid, 50 grains; white sugar, 50 grains; distilled water, 20 ounces. The dried (salted) fabric is soaked in solution No. 1 for three minutes in a darkroom or by weak gaslight or yellow light. As soon as surface dry—this being done in yellow light or away from daylight—it is drawn through solution No. 2 and again suspended to dry in yellow light. When dry, it is printed under the negative in the ordinary printing-frame, carefully stretched to avoid creases or wrinkles. Print two shades deeper than is required in the finished print. Wash in several changes of water and tone the picture in the following toning bath: saturated solution of borax, 3 ounces; water, 30 ounces; gold chloride, 2 grains. When the desired tone is reached, wash the fabric in two changes of water and fix in hyposulphite of soda, 2 ounces; water, 20 ounces, for ten minutes. After fixing, wash in ten changes of clean cold water, or twenty minutes in running water, and suspend to dry between clean wooden clips. When dry, the fabric may be flattened by ironing upon a clean cloth surface, but the iron should not be very hot.—Jarman.

Printing on Silk. Wash the silk in clean warm water to remove any grease or sizing in the fabric and dry. Prepare the following salting solution: Allow 1 dram dextrine to dissolve in 2 ounces cold water, then make up to 4 ounces with boiling water, stirring thoroughly when cold; add a solution of 1 dram ammonium chloride in 2 ounces of water. Soak the silk in this salting solution for 4 or 5 minutes and suspend to dry in the air, stretched by the corners. This is done in daylight, and the "salted" silk will keep indefinitely.

Prepare the sensitizing solution: A. Distilled water, 2 ounces; silver nitrate, 240 grains. B. Water, 2 ounces; citric acid, 100 grains. Mix these before use. To sensitize, spread this sensitizer over the silk with a soft camel's-hair brush (rubber bound, without metal). Brush the sensitizer over the silk first in one direction and then crosswise. Sensitizing and drying must be done in a weak artificial (yellow) light. Printing,

toning and fixing are done in daylight, exactly as with print-out papers, except that the silk should be stretched and attached by gummed edges to a piece of thin card, to prevent slipping or creasing in the printing-frame.

Gelatine-Bromide Paper Emulsion. Prepare the following solutions: I. Distilled water, 6 ounces; potassium bromide, 330 grains; gelatine, 80 grains. II. Distilled water, 6 ounces; silver nitrate, 400 grains. III. Distilled water, 20 ounces; potassium iodide, 12 grains. IV. Take 1 ounce hard gelatine, cut into shreds and cover with distilled water, allowing it to soak and swell therein. When No. 1, 2 and 3 are dissolved, mix No. 1 thoroughly, by stirring in a half-gallon stoneware crock; add 1 ounce distilled water to which 4 drops muriatic acid have been added. All operations from this point on must be done in ruby light. First, place the stoneware crock in a container large enough to give two inches depth of water around the crock, and place over a small gas stove. When the water around the crock has boiled 10 minutes or so, add solution No. 2 to the contents of the crock, with continual stirring. Next add solution No. 3 in the same manner and put on the stoneware lid of the crock. Keep the water about the crock boiling for 40 to 50 minutes. Then drain any excess water from the gelatine (No. 4) and add this to the contents of the crock, with vigorous stirring, for 5 minutes, or until the gelatinous mass is quite dissolved. Remove the crock and set aside until the contents are well set and cold.

Washing the Emulsion. When the contents of the crock have set, cut into pieces of convenient size and squeeze each piece (in shreds) through clean coarse muslin, letting the shreds drop into a container half full of cold water. Repeat this until all the gelatinous mass has been treated in this way. Tie cheesecloth over the top of the container holding the shredded emulsion and water and drain all the water off. Repeat this washing four times at 10-minute intervals and finally drain all the water off. Now remelt the washed emulsion in a water bath and it is ready for coating the paper, which may be done as advised for collodio-chloride emulsion; or by floating the sheets of paper down

on the emulsion in a flat porcelain tray, giving the surface two coatings by reversing the sheet end for end after the first coating.

Developer for Bromide Paper. Dissolve sodium sulphite, ½ ounce; citric acid, 10 grains; potassium bromide, 8 grains; in water, 20 ounces. Just before use, add to each ounce of the above solution 3 grains amidol. Fix in water, 16 ounces; hyposulphite of soda, 3 ounces, for 15 minutes; wash for a full hour in running water and suspend to dry.

Gelatine-Chloride Emulsion. Prepare two solutions: *A*. Silver nitrate, 240 grains; citric acid, 120 grains; distilled water, 4 ounces. *B*. Gelatine (hard), 2 ounces; sodium chloride, 30 grains; potassium citrate, 36 grains; water 16 ounces. Prepare solution *B* first, adding the chloride and citrate to the water and then the gelatine. Heat this mixture up to 104° Fahr. and stir well, until all the gelatine has dissolved. Solution *A*, cold, is then slowly poured into *B* in a fine stream, *B* being vigorously stirred with a strip of glass during this addition. To the mixture of *A* and *B* stir in alcohol, 1 dram, and 10 grains of alum dissolved in ½ ounce of water. When thoroughly incorporated, strain the emulsion through two thicknesses of fine muslin, after which it is ready for coating the paper.

Baryta or sized plain paper may be coated with this emulsion, as described under "Collodio-chloride Emulsion."

Collodio-Chloride Emulsion. Prepare two solutions. *A*. Silver nitrate, 85 grains; still water, 1 dram; alcohol, 3 ounces; pyroxylin, 1 dram; ether 3 ounces. *B*. Lithium chloride, 10 grains; citric acid, 10 grains; pyroxylin, 50 grains; alcohol, 5 ounces; ether, 5 ounces. In both *A* and *B* the pyroxylin must be dissolved in the alcohol and ether (mixed), and then the salts added and well shaken until quite dissolved. *B* is now put into a clean, dry 20-ounce bottle and *A* added to it little by little, with vigorous shaking after each addition. This gives a creamy emulsion, which must be kept in a stoneware bottle or protected from all light, and is ready for coating the paper.

Use baryta paper or any good photographic paper. If the latter, size the paper first by floating on a solution of soft gelatine, ½ ounce; water, 20 ounces, drying before coating with emulsion.

To coat paper with emulsion, stretch paper over a sheet of clean glass and place the two in a printing-frame with the back of the frame fastened in over the ends of the paper; this will keep the paper perfectly stretched and flat. Pour a pool of emulsion on the center of the paper and tilt the frame until the sheet is finely coated. Pour off the surplus emulsion, open frame, remove the paper, and suspend to dry in a cool room away from light.

Print, tone and fix, as usual with a paper of this class.

Sulpho-cyanide Gold Toning Bath for print-out papers. Must be freshly made up before use and alkaline by test. Water, 16 ounces; ammonium sulpho-cyanide, 30 grains; gold chloride, 2½ grains.

Combined Toning and Fixing Bath. Dissolve 2 ounces sodium hyposulphite in 8 ounces warm water. Dissolve 16 grains lead acetate in 8 ounces warm water. When thoroughly dissolved, add the lead solution to the hypo solution, stirring vigorously. Then add 1 grain of gold chloride and 1½ ounces common salt. Allow to stand until all sediment has settled to the bottom of bottle, and use only the clear solution.

Nichol's Combined Toning and Fixing Bath. Sodium hyposulphite, 3 ounces; gold solution (1 grain to a dram of water), 4 drams; water, 16 ounces. Dissolve the hypo in the water; add the gold solution. Print darker than is desired in the finished print.

Combined Hardening and Fixing Solution for collodion prints. Sodium hyposulphite, 1 pound; alum, 2 ounces; water, 1 gallon.

Kallitype Process. (Thomson.) Size, by immersion, any good smooth-surfaced paper, such as Scotch Linen Ledger, Whatman's Water-Color Paper, Etc.

A good gelatine size is made as follows: Water, 15 ounces; gelatine, 75 grains; alum, 45 grains; wood

alcohol, 3 ounces. The gelatine should be first allowed to swell in cold water, then, with constant stirring, that and the alum should be added to the balance of the water hot. Size sheets by immersion, afterward hanging up by one corner to dry.

Sensitizer for black tones.—Distilled water, 1 ounce; ferric oxalate (Merck's or Mallinckrodt's), 15 grains; citrate of iron and ammonia (brown scales), 25 grains; chloride of copper, 8 grains; oxalate of potassium, 35 grains; oxalic acid, 15 grains; silver nitrate, 15 grains; gum arabic, 10 grains.

Mix in the order given in a wide-mouthed dark bottle. Without agitation more than turning upside down once or twice, set aside for twelve hours. Stir up from the bottom, then shake well. Filter through absorbent cotton. The bottle should be rinsed clear of sediment before the filtered solution is once more placed in it. The solution is now ready for use, and will keep in good condition, when well corked, for a year at least. The formula is given in ounce quantities, to answer requirements of workers having small negatives. Simply multiply quantity in accordance with needs.

Coating may be done either with a flat brush or a celluloid flexible pad covered with white velvet or plush.

A heavy sheet of glass is a good ground on which to coat. It may be raised at the upper end, thus insuring a downward flow of solution. Clasp the paper at the four corners of the glass by attachment of clips.

In coating, pour sensitizer on the upper portion of sheet, and, as quickly as possible, go all over the surface. The idea is to get the entire surface well coated and wet as soon as possible, so that drying will be equal. An even, thin coating is essential, as pools of solution simply mean spots that print darker than balance of surface. When surface-dry, complete by artificial heat.

Print until all but the whites are tinted, though time is governed to some degree by the paper employed. On heavily sized and rough paper we may be obliged to take from the frame before the half-tones are visible. When printing is completed, develop the faintly defined tawny image in the silver solution, which should be made up as follows:

Distilled water, 1 ounce; silver nitrate, 40 grains; citric acid, 10 grains; oxalic acid, 10 grains. When all dissolved, decant or filter through a piece of fine linen, there being a milky precipitate we want to get rid of. Another way is to add the oxalic acid just before developing, when the milky condition of the bath will not matter. In every event we require about a grain of the acid to each dram of solution. This is a stock solution, and to develop 4 x 5 prints we measure out two drams, and add water to make two fluid ounces. Use a porcelain tray. Immerse print, face down, immediately turning over to break any bubbles, which, if present, will cause white spots in the finished print. The image immediately flashes up, but the print should remain, say, a minute, so that blackening will be even. In order to get black tones, a sized paper must be used. Too thin a coating, which may be the case where sizing is insufficient, means scraggy brownish prints, the image lacking depth.

After development, wash away the silver, then immerse in a weak hypo bath for five minutes—water, 32 ounces; hypo, 50 grains. Prints on rough paper may remain in this bath for ten minutes. Some papers will not stand long immersion; in such cases, if the paper be thin,—say Japan tissue,—two minutes' fixing will be enough. In any event, when the whites in the finished print are at all dingy, it is indicative of insufficient fixing. In such a case, expose until half-tones are visible, then fix well. After fixing, wash for at least half an hour.

Ferro-Prussiate (Blue Print) Process. Blue prints may be made on any kind of paper, provided it is sufficiently sized, but the better the paper the better the print. Good, hard-sized linen or bond paper is always suitable and readily obtained. The photographic papers Rives and Saxe are perhaps those most desirable for general use, but Rives paper is not easily procured in this country. Crane's bond papers are always reliable. Cartridge, Johannot and Whatman papers offer other varieties for special purposes.

To size any paper, make up the following sizing solution or mixture: Take powdered arrowroot, 180 grains; glucose, 40 grains, and mix them in a little cold water,

to form a creamy mass. Add 20 ounces of hot water, boil in a porcelain or agate pan, with constant stirring, and set aside to cool. Later, the tough skin which forms is removed and the mixture is strained through canvas, when it is ready for use. Now fasten a number of sheets of paper, cut to convenient size, to a board slightly smaller than the paper. Taking up a small quantity of the sizing on a soft sponge, spread it evenly over the paper, brushing the mixture first up and down and then across the sheet. Then, with a second (clean) sponge, lightly efface all brush marks or streaks, and hang the sized sheet to dry in a warm, well-ventilated room or closet. Thin papers can be sized by immersion in the sizing solution.

A reliable sensitizing mixture is prepared as follows: *A*. Dissolve 110 grains ferric ammonium citrate (green) in 1 ounce of water. *B*. Dissolve 40 grains of potassium ferricyanide in 1 ounce of water. These two solutions are made up separately in any desired quantity with the proportions here given. They are then mixed together and kept in a stoneware bottle, but the single solution should always be filtered before use. The mixture will keep for months if stored away from light in dark brown or stoneware bottles.

Sensitizing the paper should be done in weak daylight or any artificial light of not too great intensity, the sensitizer being applied to the paper exactly as described for sizing, but with a sponge or brush or wad of cotton used exclusively for this purpose. Coat the sheet in successive strips with a brush not too dry or too fully charged with solution. Do not coat too quickly or too slowly; the brush should be passed over a twelve-inch sheet as quickly as you can count ten, saying the words deliberately. After coating the sheet with strips up and down, take a slightly drier sponge or brush and pass across the sheet from side to side, to ensure an even coating free from streakiness. After the sensitizing is completed, the paper should be dried as quickly as possible and then stored in a tin or other receptacle away from light or damp until used.

Development is effected by simply placing the print in cold water, so that the whole surface of the print is

wetted immediately, and changing the water occasionally until all the details are seen to stand out clearly defined and with good gradation. After changing the water two or three times, let the print remain face down for ten or fifteen minutes, to thoroughly clear away the iron salts from the texture of the paper. To insure brilliant prints, development should not be done in very strong light, as this tends to veil the finer details. Water containing alkalies, such as lime, chalk, etc., also tends to degrade the brilliancy of the blue print. This should be remedied by adding citric acid (20 grains to each pint of water) to the wash water. A single rinse in plain water at the last will remove all traces of the acid from the print. Over-long washing, especially in slightly alkaline waters, reduces the strength and brilliancy of the print. A properly exposed and developed blue print is always more brilliant when it is dry than it appears when in the wash water.

Developer for Platinum Prints. Prepare stock solution *A* as follows: Dissolve potassium oxalate, 6 ounces, in hot water, 20 ounces. Put aside for a day or two until well cleared. To develop black-tone paper, take: Stock solution *A*, 6½ ounces; water, 14 ounces; saturated solution oxalic acid (poison), 1 ounce. Another formula, advised for Eastman papers is: Stock solution *A*, 6½ ounces; potassium phosphate, 1 ounce; water to make solution up to 20 ounces.

Clearing Bath for Platinum Prints. For black-tone papers: hydrochloric acid, 1 ounce; water, 60 ounces. For sepia papers: hydrochloric acid, 1 ounce; water, 80 to 120 ounces. The use of five (not less than three) clearing baths is advised, followed by thorough washing.

Intensifier for Weak Platinum Prints. Prepare two solutions. *A*. Sodium formate, 45 grains; water, 1 ounce. *B*. Platinum perchloride, 10 grains; water, 1 ounce. Rinse the prints after the last acid clearing bath, and immerse for 15 minutes (or until sufficiently intensified) in a solution made up of 15 minims each *A* and *B* to each 2 ounces of water.—Hubl.

Increasing Contrast in Platinum Prints. Dissolve 30 grains potassium bichromate in 1 ounce of water. Add a drop or two of this to the developer, when an increase of vigor will be apparent in the prints. Repeat the addition of bichromate, as necessary, from time to time.

Carbon Sensitizer. A quick-drying sensitizer for carbon tissue may be made by dissolving 50 grains ammonium bichromate in 10 ounces of water and adding 1 ounce of alcohol. Immerse the sheet of tissue completely in this solution for fully 5 minutes. Take the sheet from the solution, place it face down on a piece of clean glass, and lightly squeegee the superfluous liquid from it. If suspended to dry (away from daylight) in any well-ventilated room, the tissue will be ready for printing within three hours.

LANTERN SLIDE MAKING AND PROJECTION

Lantern Slide Making: Table of distances required: A, from lens to lantern plate, and B, from negative to lens, when making lantern slides by reduction in the camera from different sizes of negatives. (3-inch slide.)

From negative 3¼ x 4¼.—With 5-inch lens: *A*, 8¾; *B*, 11⅔. With 5½-inch lens: *A*, 9⅝; *B*, 12⅝. With 6-inch lens: *A*, 10¾; *B*, 14⅓.

4 x 5.—With 5-inch lens: *A*, 8; *B*, 13⅓. With 5½-inch lens: *A*, 8⅘; *B*, 14⅔. With 6-inch lens: *A*, 9⅔; *B*, 16. With 6½-inch lens: *A*, 10⅖; *B*, 17⅔.

4¾ x 6½.—With 5-inch lens: *A*, 7¼; *B*, 15¾. With 5½-inch lens: *A*, 8; *B*, 17½. With 6-inch lens: *A*, 10¾; *B*, 19. With 6½-inch lens; *A*, 10¾; *B*, 20½. With 7-inch lens: *A*, 10¼; *B*, 22¼. With 8-inch lens: *A*, 11¾; *B*, 25¼.

6½ x 8½.—With 5-inch lens: *A*, 6⅜; *B*, 19¼. With 6-inch lens: *A*, 8⅛; *B*, 23. With 7-inch lens: *A*, 9½; *B*, 26¾. With 8-inch lens: *A*, 10⅝; *B*, 30¾. With 10-inch lens: *A*, 13½; *B*, 38¼.

Lantern Slide Developers. Ferrous-Oxalate (neutral black-tone slide). Prepare two stock solutions as

follows: *A*.—Sulphuric acid, 30 minims; warm water, 20 ozs.; iron (ferrous) sulphate, 5 ozs. *B*.—Potass. oxalate, 5 ozs.; potass. bromide, 10 grs.; warm water, 20 ozs. Pour 1 part of *A* into 4 parts of *B* (not *vice versa*). When this developer is used, plates must be passed straight into a weak bath of acetic acid (1 part "glacial" acid in 60 parts water) after development, allowed to stay there for five or ten minutes, rinsed, and then fixed in an acid bath. This treatment is necessary to prevent the chance of yellow stain, but no other developer requires it.

Metol. A good formula is as follows: *A*.—Metol, 100 grs.; soda sulphite (crystals), 2 ozs.; water, 20 ozs. *B*.—Potass. carbonate, 300 grs.; ammonium bromide, 60 grs.; potass. bromide, 120 grs.; water, 20 ozs.

Equal parts of *A* and *B* are mixed to form the developer. It will be found that exposures require to be considerably shorter (about half) than when using the ferrous oxalate or the hydroquinone developer.

Hydroquinone. An excellent formula is the following: *A*.—Hydroquinone, 150 grs.; potass. metabisulphite, 10 grs.; potass. bromide, 50 grs.; water, 20 ozs. *B*.—Soda sulphite, 2 ozs.; caustic soda, 100 grs.; water, 20 ozs. Mix equal parts of *A* and *B*.

Fixing Lantern Slides. When development is complete, the plate should be well rinsed and fixed. A plain hypo bath, made up by dissolving 6 ounces of hypo in a pint of water, is preferred by many workers. But this calls for a clearing bath, after fixing, made up of a saturated solution of alum and citric acid (equal parts) and the use of an acid fixing bath is the better practice. Such a bath is prepared as follows: Solution No. 1—Water, 48 ounces; hypo, 1 pound; sulphite of soda (crystals) 1 ounce. Solution No. 2—Water, 16 ounces; chrome alum, 1 ounce; sulphuric acid, 60 minims. Mix the chemicals in the order named. When each solution is thoroughly prepared, pour No. 2 into No. 1 slowly, stirring No. 1 while No. 2 is being added.

Diagram or Announcement Slides. A simple method of producing these is to draw the diagram with opaque white ink on black paper, such as that used for

packing plates or bromide papers. This is then photographed on a lantern plate or slow ordinary plate, and the negative so obtained is used as the slide. If necessary, it may be cleared with the ferricyanide and hypo reducer, but this is rarely needed.

Effective title slides can be made by lettering the title or descriptive matter in white over an appropriate illustration or photograph, from which the negative and slides are afterward made. Where white lettering is done on a dark ground, the lettering in the slide may be effectively colored by staining the film with the liquid dyes sold for tinting photographs. Do not mix these dyes before applying, but wash them on separately. For example, if green is desired, give a faint wash of yellow followed afterward by a wash of blue, and so on. Diagram slides may be made by hand by simply coating lantern-slide plates with a thin colorless varnish, upon which the design or lettering desired is written or drawn, with pen or brush, according to the expertness of the individual worker.

Lantern Screen Formula. In preparing to give a lantern exhibition, it becomes necessary to determine the focus of the lens required to make a picture which will cover the screen at a given distance. This formula will be found accurate:

S—Size of opening in slide, in inches.
D—Diameter of disk on screen, in feet.
L—Distance from objective to screen, in feet.
F—Equivalent focal length of projection objective.

This is the formula which will convey the desired information:

$$\text{Then } L = \frac{D \times F}{S} \quad D = \frac{L \times S}{F} \quad F = \frac{L \times S}{D}$$

For example, if it is desired to work in a hall at fifty feet from the screen, with an image ten feet square, using a slide the opening in which is three inches, what must be the focal length of the lens?

It works out thus:

$$F=\frac{L\times S}{D} \quad L=50 \quad S=3 \quad D=10$$

Therefore, $\frac{50\times 3}{10}=15$ inches, the focal length of the lens required.

This formula can be employed in determining the distance from the screen required by a lens of any focus, provided the focus is known, and it can be used for longer or shorter distances, as shown above.

Table Giving Length of Throw, Equivalent Focus of Lens, and Diameter of Disk on the Screen for all Distances from Ten to One Hundred Feet, and for all Lenses from Five to Twenty Inches Focus:

Focus of Lenses	Distance from Objective to Screen, in Feet									
Diameter of Image on Screen	10	20	30	40	50	60	70	80	90	100
20-inch				6	7½	9	10½	12	13½	15
18-inch				6½	8	10	11½	13	15	16½
15-inch		4	6	8	10	12	14	16	18	20
12-inch		5	7	10	12	15	17	20	22	
10-inch		6	9	12	15	18	21	24		
8-inch		7	11	15	18½	22				
7½-inch	4	8	12	16	20	24				
7-inch	4½	8½	12½	17	21					
6-inch	5	10	15	20						
5-inch	6	12	18	24						

Notes and Comment

The unreasonable war scare, so far as it affected the photographic world here, seems to have blown over, and there is nothing of it left, except the inevitable stiffening of prices on chemicals. Of course, dealers are talking about the shortage of this and that; but this is done chiefly to restrict the tendency of many professionals and amateurs who over-buy and hoard for the future. The Eastman Kodak Company, in a "War Extra," rightly says: "There is no present cause for alarm as to the effect of European conditions on the retail photographic business of this country. There is more danger today from over-ordering on the part of consumers and dealers than from a scarcity of raw materials. The photographer who now puts on his shelves materials for a year ahead, in anticipation of a shortage, will be likely to find himself, later on, the possessor of a lot of deteriorated goods."

The principal manufacturers and importers tell me that they have abundant stocks on hand for all reasonable demands during the next six months or more. In that time a great many things can happen, and serious progress may be made toward supplying the American market with American-made goods. So that there is nothing whatever to complain about, and no reason for any sort of panic. As matter of fact, there are many indications that we are entering upon a period of unusual prosperity.

In answer to several readers who have asked where they could obtain the Wold air-brushes, I am advised that these brushes and supplies for their use can be obtained from the Palette Art Company, 56 East 23rd Street, New York City, who will be glad to send illustrated circulars on request.

We are advised that "Photograms of the Year 1914," the Pictorial Record of the Year's Best Photographic Work, edited by F. J. Mortimer, will be issued as usual this autumn; the American edition will doubtless be ready for delivery in November. "Photograms of the Year" is the only annual in which one can get a survey of what pictorial photographers all over the world are doing. The reproductions of the pictures selected are very carefully engraved and printed, and the volume is one which no pictorialist can well afford to miss. Paper covers, $1.25; cloth covers, $1.75.

G. Gennert, New York, Chicago and San Francisco, advises us that he is assured of abundant supplies of the famous Ensign pocket cameras, hand cameras, reflex cameras, Ensign films and Imperial plates. The new Ensign catalogue is an eye-opener in the wonderful range and variety of the Ensign cameras which it displays. The man who is seeking a compact and efficient pocket camera, for use during the winter should see the Ensign line with its special optical equipments.

In press photography, where speed is generally essential, the Imperial flashlight plates and press bromide papers are valuable aids. These Gennert importations can be had through any dealer in the United States at standard or normal prices.

Among the many anastigmats available for hand-camera work, especially where short focal length is desirable, the Goerz Dagor *f*/6.8 and the Goerz Syntor *f*/6.8 are noteworthy. The Dagor was formerly known as the Goerz Series III, and has stood the test of twenty years' experience, proving itself to be one of the most popular lenses ever introduced in this country. I have increasing satisfaction in the work done with my Dagor, which I purchased when the C. P. Goerz American Optical Company first opened their American branch. It is a symmetrical doublet, remarkable for the microscopic definition which it gives, and the speed is suffi-

cient for all hand-camera work. Its single combinations can be used separately, giving an image of any object almost twice as large as the image of the same object from the same viewpoint afforded by the complete lens.

The Syntor consists of two symmetrical uncemented combinations, which are brought very close together, thereby insuring an even distribution of light over the whole plate, with an angular capacity of 64 to 70 degrees. As with the Dagor, so the single combinations of the Syntor can be used as separate lenses, giving larger images from identical viewpoints. The Syntor can be had in special mountings for use with the V-P Kodak and Premoette Junior. Doubtless it could be fitted to any of the pocket cameras at present available. Apart from its quality, it is remarkable for its reasonable price.

An extraordinary bargain in cameras is being offered just now by "Square Deal Willoughby," 810 Broadway, New York, in the shape of a new No. 1 Century view camera, for 6½ x 8½ pictures, with one plate holder, extension bed and case, at $12.50 (regular price $22). The Century view camera has long been known as one of the best instruments in its class, and those who have use for such a camera could not do better than invest now with Willoughby. The offer holds good only until the supply on hand is exhausted.

Some remarkably interesting offers to amateur photographers are made in the advertisement of Burke & James, Inc., in this issue. The announcement is too lengthy to condense here, but should be seen.

"The British Journal of Photography Almanac 1915," which usually makes its appearance in December, will not be published until some time in January, 1915. "The American Annual of Photography, 1915," we are advised, will be ready about the 25th of November, as in past years.

An anastigmat of the highest grade at a reasonable price is the Collinear Dynar $f/6$, which is offered in cells fitting any standard shutter, for 3¼ x 5½ or 4 x 5 cameras, at $23.50. $f/6$ means practically twice the speed of a good rectilinear, and opens up all sorts of possibilities when facing difficult light conditions or for use in indoor portraiture. Send for the new catalogue with revised tariff prices. Voigtlander & Sohn Optical Co., 242 East Ontario Street, Chicago, Illinois.

The minutes of the Thirty-fourth Annual Convention of the Photographers' Association of America, held at Atlanta, Georgia, June 15 to 20, make up an interesting and beautiful quarto volume of 150 pages with eleven full-page illustrations of remarkable quality. The printing and general get-up of the book reflect great credit upon Mr. Frank V. Chambers, of Philadelphia, under whose supervision the work was done.

An Exposition of Photographic Arts and Industries is announced to be held at the Grand Central Palace, New York City, March 27 to April 3, 1915, under the auspices of the Photographic Dealers' Association of America, in connection with the Third Annual Convention of this body.

"How to Make a Studio Pay:" A Practical Manual for the Profession. By Frank Farrington, with an introduction by Ryland W. Phillips; 123 pages, $1 net, postpaid. New York: Edward L. Wilson Company.

Here is a book which every professional photographer should get and read at least half a dozen times over. The titles of its chapters indicate its practical scope: The Man and the Location, Buying and Arranging the Stock, System in the Studio, The Treatment of Customers, How to Know the Profits, Credits and Collections, Developing Side Lines, Advertising You Can Do, Business-Getting Schemes. There is not a page in the book which does not offer money-making or money-

saving suggestions. It is evident that Mr. Farrington writes from a wide and varied experience, and he has the gift of saying what he has to say in a few words, vitalized by a personal interest, which makes one reluctant to put the book down until read through from cover to cover.

We hope that the excitements of the summer vacation and the distractions due to the European war have not caused any reader of THE PHOTO-MINIATURE to overlook the Ansco Company's "Loveliest Women Competition." This is intended to obtain for the Panama-Pacific Exposition at San Francisco, next year, an exhibit of life-size photographs of America's Fifty Loveliest Women. Needless to say, already thousands of competing prints have been received by the Ansco Company. The prizes, ranging from one of five hundred dollars to twenty-five of fifty dollars each, are alluring. The jury of award will be composed of Minnie Maddern Fiske, the distinguished actress; Harrison Fisher, the well-known illustrator, and Alfred Stieglitz. The competition is to close on December 1, so that only two months remain for those who have not yet entered upon the good work. Get the descriptive circular from your nearest Ansco dealer.

"Saturday With My Camera:" A Popular and Practical Guide to the Work of the Amateur Photographer for Every Season of the Year. By Stanley C. Johnson; 440 pages, with over 100 pages of diagrams and plates. Cloth, decorated cover, net $1.50; postage, 10 cents. Philadelphia: J. B. Lippincott Co.

In this handsome volume, with its many beautiful illustrations, we have a practical handbook to amateur photography arranged upon the novel plan of dividing the amateur's year under the four seasons, and written from the viewpoint of the busy worker who can devote only the leisure of his week-ends to his hobby. We heartily commend it as one of the most satisfactory textbooks at present available.

Across Crescenta Valley, California
Edgar A. Cohen

The Photo-Miniature
A Magazine of Photographic Information
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Flashlight Photography

Properly told, the story of flashlight photography would rival, in its absorbing interest, a tale from the "Arabian Nights." Think, for a moment, of our slavish dependence on daylight in photography! How the lack of daylight shortens our photographic days, gives rise to endless waste and failure, and extinguishes innumerable picture-making possibilities. Then, if you will, set out to dream of all that favored mortal could do who could carry in his pocket a supply of bottled sunlight. How surely, as we dream, the glamour of that ancient tale of Aladdin's Lamp fades beyond recall! Here, however, the tale and dream are put aside, and we are to deal with prosaic fact. The flashlight of today is, in truth, the bottled sunlight of our dreaming, and you, gentle reader, are the favored mortal. Read on, and learn the practical meaning of flashlight photography, with all it holds for your profit or pleasure.

The flashlight is no new thing in photography. Almost fifty years have passed since an enthusiastic amateur, C. Piazzi Smyth, then Astronomer Royal of Scotland, made use of it to obtain the first photographs of the Royal Chambers of the Pharaohs, in the interior of the Great Pyramid. Since that time "man hath found out many inventions," and flashlight methods have been so far perfected that today hundreds of photographers are using the flashlight exclusively in their work, where daylight is not available or is unequal to the requirements of the subject.

What It Has Done

Thus, for familiar examples, the flashlight has brought financial success to many specialists in the photography of engineering and machine-shop work; in mining and subterranean-construction work, as in the building of subways for underground railways; in the production of large posters for theatrical advertising; the photographing of indoor athletic and sporting events at night, notable banquets, public gatherings and social affairs, from the big convention to the fashionable wedding or house party.

Equally familiar are the remarkable flashlight pictures of big game, made in the wilds of Africa and nearer home by such camera-sportsmen as Schillings, Dugmore and Shiras, showing all manner of fearsome beasts in their native haunts. In portraiture, also, both in the studio and at home, the flashlight has proved an invaluable aid when capably handled, giving a facility for obtaining the natural, unconscious expression of the subject, and a sureness of results (freedom from movement) not always obtainable in daylight work.

Its Possibilities

Despite all this, however, the most remarkable thing about flashlight photography is the general ignorance and indifference as to its wonderful possibilities, and especially as to its simplicity and certainty. The majority of amateurs, if they think of it at all, regard it as an experimental method, requiring special skill, uncertain in result, and involving at least some danger or risk of personal injury in its practice. The average professional, by nature abnormally conservative, either ignores it altogether or, admitting its undeniable advantages, procrastinates. The plain fact of the matter is that, were the possibilities of the flashlight properly appreciated, the amateur could multiply his photographic pleasures at least tenfold; and the professional would find in it a ready means of adding materially to his business income, with little or no increase in his overhead expenses. Without a doubt, the subject is one well worth our looking into, and so affords ample scope for this little book about it. Let us begin, as we always do in these pages, at the beginning.

The Great Limitation

As Everyman knows, the great limitation in all photography is the necessity of securing sufficient light to get a successful photograph within the exposure period required by the subject. It is this limitation—plainly, the lack of light—which cuts off almost every use of the camera after sundown, just when the amateur's leisure begins, restricting the practical range of available subjects to outdoor work, and what may be done in well-lighted rooms during the summer months. So, for the majority of amateurs, the "photographic year" means from May to October, and from ten in the morning to four in the afternoon. All the indoor life that sparkles with pictorial opportunities from October until May is lost—for lack of light.

The same great limitation—lack of daylight—shortens the working day and, therefore, lessens the productive power of the professional photographer, just when he most needs power, during the dark and uncertain days preceding the Christmas holidays. For the same cause many photographers find it necessary to open their studios on Sundays, for the accommodation of those who cannot come to be photographed during the daylight hours of the workaday week. More than all this, as we know by sad experience, the variability and lack of actinic power of daylight are familiar causes of failure in photographing many subjects, with the inevitable trouble and expense of doing all the work over again. And, again, there are many profitable fields of special work, already mentioned, where some form of artificial light must be employed to get the record or the opportunity must be lost.

Independence of Daylight

The flashlight, in one or other of the many forms available today, removes this great limitation, simply, effectually and completely, giving the photographer absolute independence of daylight in every branch of indoor photographic work for pleasure or profit.

For the Amateur

It offers the amateur a ready means of making successful photographs in the home, with the inestimable advantage of complete control over the two all-important factors,

light and exposure, whenever the opportunity comes or the spirit moves him to make the opportunity. Individual portraits, groups, color portraiture, family festivities, the children at their games, house parties, silhouette pictures, pictorial work with models, the photographing of household pets, flowers, Christmas trees, printing, copying and lantern-slide making, are some of the obvious ways by which the flashlight extends the amateur photographer's pleasures over the whole year from January to December. It must not be supposed that the usefulness of the flashlight is confined to the winter months. Since one of its peculiar advantages is that it insures control and uniformity in illumination and exposure, when the same amount of powder is used at a given distance from the subject, it follows that its use is as advantageous for summer-evening portraiture, indoors or on a porch, as for similar forms of winter work in or about the home.

For the Professional

Similarly, a practical knowledge of modern flashlight methods will bring new revenues to the professional photographer who is awake to his business opportunities, by enabling him to extend his studio hours on dull or dark days, or during his busy season; by widening his capacities to include color portraiture, at-home work and groups of local gatherings, wedding-parties, store interiors, lodge work and other branches of so-called commercial photography usually given to outside specialists. It may be mentioned here, as a matter of practical experience, that not a few professionals are today using the flashlight as an auxiliary in their studios, preferring it to daylight, as simplifying their procedure, and giving a larger percentage of successful negatives in photographing childen and other restless subjects. Those who are skeptical as to this may obtain details and proofs of what is being done in this direction from the manufacturers of flashlight powders and apparatus. In color portraiture, with Autochrome and Paget plates, the flashlight is, of course, indispensable on the score of exposure. The remarkable success achieved in this specialty by a few studios here and abroad is worthy of note. There is here, in fact, a profitable field open to

the flashlight worker, which is bound to widen year by year, but which photographers have thus far largely neglected.

With this preliminary survey of the possibilities of the flashlight, we can now turn to the practical side of flashlight work, giving our attention first, of necessity, to the working materials, powders, plates, apparatus, etc., after which we will take up the methods employed in their use in different classes of photographic work.

Essentials of Flashlight

The essential requirements of a practical flashlight are: (1) sufficient intensity (light power) for the purpose in hand; (2) rapidity of combustion (flash) sufficient to give a picture image without blur from possible movement in the subject; with (3) a minimum amount of smoke following the flash; and (4) safety in handling and working with the light.

Kinds of Flashlight

Two kinds of flashlight are generally available today, viz., pure magnesium metal, in finely powdered or ribbon form; and flashlight compounds, in powder form only, consisting of magnesium mixed with various highly oxidizable substances, by which admixture these compounds possess very definite advantages over plain magnesium, as we shall see later. In America and Germany, where the manufacture of flashlight compounds has been extensively studied and developed, the use of this form of flashlight is generally preferred to plain magnesium. In Britain, on the other hand, plain magnesium is more generally employed. As these two kinds of flashlight differ widely in their characteristics, methods of handling, and efficiency for various uses, it is desirable that we should know something about their differences before going further.

Plain Magnesium

Plain magnesium, when thoroughly ignited, gives an intense, blue-white light, with considerable heat, combustion (of the powder form especially) being followed by a heavy volume of whitish smoke or vapor, magnesium oxide, which falls as a white dust. This smoke following each flash, and the slowness of combustion (duration of flash), as compared with the greater rapidity

with less smoke of the flashlight compounds, are the two big disadvantages of plain magnesium. Even under the most favorable conditions, as when powdered magnesium is blown through an alcohol flame, the flash will occupy at least one-tenth of a second. This, from our modern viewpoint, bars its use for portraiture, although very satisfying portraits and portrait groups were produced with plain magnesium before the flashlight compounds of today were available. The amount of smoke acompanying the use of magnesium is much less with the ribbon than with the powder form. It must be thoroughly cleared away before a second flash can be made, and the dust deposited after each flash is considerable and all-pervading. These are troublesome inconveniences when working in the home, or in any place where a good passage of air is not readily obtained. In spite of which, plain magnesium has many advantages outside of portraiture, and should not be put aside, as too often happens, without consideration. No danger whatever attends its use, provided the hands, face, clothes, and nearby draperies are kept from contact with the flame (which flares or spreads during the flash), or from falling or scattering unburnt particles of the super-heated metal. These are easily avoided by a very little carefulness. For many purposes, where a time exposure is desirable or advantageous, as in printing on gaslight papers, copying, lantern-slide making, or local lighting in photographing interiors, plain magnesium is more convenient than the use of compound powders.

Magnesium Ribbon

Magnesium ribbon ignites less easily and burns more slowly than the finely powdered form, but is less troublesome to handle, gives off less smoke, and has its own peculiar usefulness. It comes as a coil of tape, about half-an-inch in width, an ounce containing about 120 feet, and four or five inches being equivalent about to a grain in weight. An inch of ribbon gives as much light as a six-foot gas-burner, or as two three-quarter-inch kerosene lamps burning four minutes, all, of course, burning at the same distance from the subject. These details are worth noting since exposures, with ribbon, are measured by inches rather than by time. Usually it is

sold in a small circular or pear-shaped box, marked in inches around the rim, so that as many inches as are needed may be measured by drawing the tape out of its slit, the box being held in the hand during exposure. Otherwise the amount of ribbon required is cut into strips of convenient length (a few inches), and held in a pair of pliers, or in the slit of a pen nib in the familiar penholder or a cleft at the end of a stick, or suspended over a piece of wire. If it is desired to have the hands free during the flash, any device may be adopted which will suspend one or more strips of ribbon over a metal tray or pan, to catch the hot ash or unburnt particles which fall during combustion. From this it will be seen how simple is the use of magnesium ribbon.

Interior: Small Groups at Home

For example, suppose we want to make a picture of a small interior, or a group seated at a supper table. Take a tin biscuit box, such as any grocer can supply; remove the front side and twist four 6-inch strips of ribbon over a wire stretched from side to side of the box, under the lid. At the bottom of the box place a small tray containing alcohol or a little alcohol lamp. Place this improvised light box eight feet away from the group or subject, at one side of and well above the camera. When ready for the exposure, ignite the alcohol with a wax taper or match so that the flame will touch the ribbon, and the flash is made. It is obvious that as many strips of ribbon may be ignited simultaneously in such a light box as one may desire or the individual subject requires.

Portraits with Ribbon

A similar device for the use of magnesium ribbon in making head and shoulder portraits, described in a recent issue of *Photography*, is worth republishing here. It consists of a board about two feet long and ten inches wide. This stands on end, the base being another board twelve by ten inches. A third board of the same size as the base is fastened to and projects from the top of the upright board. To the front edges of the projecting top and base pieces is fastened a light frame twenty by twenty-four inches, covered with tissue paper, to serve as a light diffuser or screen. At the center and near

the top of the upright board a six-inch nail is driven, so as to project at least four inches. On this is slipped a bulldog clip. Ten inches below the clip a six-inch shelf is fastened to the upright board. On this shelf is placed a tin dish (such as the lid of a biscuit box), in the center of which, immediately under the clip, place a pattypan or similar small circular tin tray. Six strips of ribbon are now cut from the coil and straightened, each six inches in length, and fixed in the clip suspended over the pattypan. A teaspoonful of alcohol is poured into the pattypan and the outfit is ready for use.

To make the portrait, place the subject well away from the wall of the room or other distracting background. Extinguish the usual lights of the room and get the scheme of lighting desired for the picture with a handlamp or candle, turning the head slightly away from the light. Now, with the usual illumination of the room, focus the subject carefully, place the light outfit at the place previously determined upon as giving the lighting desired, and fix a sheet or other reflecting screen near the figure, so as to throw a little light into the shadows of the face. See that the light outfit is placed higher than the camera, and that the light and reflecting screen do not come within the field of the lens. When ready, make the exposure by removing the cap of the lens or opening the shutter and igniting the alcohol under the ribbon by means of a wax taper. This will give a well-exposed portrait with an ordinary fast plate or film, and a lens working at *f*/8.

Lamplight groups, fireside effects, etc., may be obtained with such an outfit, the lamp being placed near or on the floor according to the subject and kept out of the field of the lens.

Copying

For copying, the amount of ribbon needed will, of course, vary with the character of the original to be reproduced. As a rough guide about two inches of ribbon will be sufficient for a small original, used at two feet from the print being copied and slightly waved in the hand during the burning of the ribbon. This suffices for a fairly rapid plate and lens at *f*/8. Care should be taken to keep the light outside of the field of the lens during the

flash. This method is as efficient when working during the day as it is when used at night.

Gaslight Paper Printing

In gaslight printing, at any time, the use of magnesium ribbon affords not merely an efficient light source, but also the big advantage of uniformity of exposure. The ribbon is used in conjunction with a printing or exposure board some few feet in length and marked across at every six inches. At one end of the board a hole is drilled and a piece of narrow metal tubing inserted, to form a metal upright with a slit cut at the top end to hold the ribbon during exposure. Or a lighted candle may take the place of the metal upright, the ribbon being held over the candle flame in a pair of pliers, to give the exposure. For an average negative used with carbon velox, one inch of ribbon, burnt with the negative at twelve or eighteen inches away, will give a good print. The amount of ribbon needed and the distance away at which the negative is placed will, of course, vary with different negatives and brands of papers, and must be determined for each negative by experiment. But once these figures are known and noted at the corner of the negative, good prints may be had from that negative at any time by following the data so obtained. The reader who will systematize his gaslight printing according to the method here outlined will find his work much simplified, and more quickly put through than by the slower method of using gas or electric light, apart from the greater certainty of result gained by uniform exposures.

Burning Ribbon in Oxygen

Abney, commenting on the fact that magnesium burns more rapidly, and gives a more intense light, in oxygen, says that 36 inches (or 12 grains by weight) of magnesium ribbon burnt in a flask of oxygen at 6 inches from an average negative will give a fully exposed print on platinum paper. Similarly 6 inches of ribbon (roughly 2 grains by weight), burnt in oxygen, will give a well-exposed portrait negative at 9 feet from the subject. This hint may be useful to those who can provide a suitable means for the use of a supply of oxygen in this way. The Platinotype Co. (London)

formerly supplied an outfit for this purpose, but I do not know where it can be obtained in America.

Some Suggestions

It is needless to do more than suggest some of the many uses for which magnesium ribbon offers special advantages to amateurs and professionals alike. In making difficult interiors by daylight, a few inches of ribbon burnt here and there during the exposure will serve to illuminate deep shadows and so give a more harmonious negative. This device has proved immensely useful in photographing heavy machinery where cast shadows are liable to obliterate desirable details. For making clean-cut photographic silhouettes, the use of magnesium ribbon is preferable to any other form. In this work, a sheet is suspended at a doorway or opening between two rooms, the subject and camera being placed in one room and an assistant with a supply of ribbon and a lamp at the other side of the sheet. After carefully focusing the subject as arranged close to the sheet, a word to the assistant secures the flash and the silhouette is made. The advantage of ribbon here is that it gives a steady white light, occupying from one to three seconds, without shock or disturbance to the sitter, and without smoke or dust worth mentioning, so that several exposures may be made one after the other without inconvenience. Campfire pictures, out-of-doors, may be obtained by suspending, say twelve 4-inch strips of ribbon on a wire fixed about ten inches above ground in the center of the group, with an alcohol lamp at the base of the strips. Ignition by a lighted taper at the end of a stick will give the exposure at the convenient moment.

Magnesium Powder

Plain magnesium, in powder form, differs little in general characteristics from magnesium ribbon, but its form permits of more thorough and more rapid combustion, which means increased intensity or light efficiency, giving it a wider usefulness. Where large volumes of light are needed, the powder is much more convenient to handle than ribbon; and where a time exposure of from one to ten seconds is possible, or will give a more harmonious negative of the subject than a rapid flash (as will often happen), the use of magnesium powder is pre-

ferred by many to a flashlight compound. In use it is simple and wholly free from any danger, but the flash is followed by considerable smoke, and it will not give an exposure shorter than one-tenth second.

The Lamp for Magnesium With this form of flashlight, the light or flash is obtained by driving the powder through a flame by pneumatic pressure, the familiar rubber bulb and tubing being used to supply the air-pressure. A lamp is therefore a necessity. Flashlamps for the use of plain magnesium are known as storage, magazine or blow-through lamps, and must not be used for compound powders. In almost all such lamps a metal reservoir is provided to hold an ounce or so of magnesium powder. At one side of this reservoir there is an inlet for air, connected with a rubber tube and bulb, by which a single continuous stream (or several disconnected streams) of air can be sent through the powder-supply by simple pressure of the bulb. At the other side of the reservoir is an outlet through which, when the bulb is pressed, the powder is forced as a fine spray through the center of a flame supplied by igniting a circular wick saturated with alcohol. The duration of the flash depends upon (1) the length of time for which the air-pressure is continued, and (2) the powder capacity of the reservoir, usually covering from one-tenth of a second to ten seconds.

Note This The big fact to remember about all lamps intended for use with plain magnesium—storage, magazine or blow-through lamps—is that they must never be used with compound powders or flashlight mixtures. If this is done, either by mistake or carelessness, a violent explosion is certain. The reason for this is plain. Magnesium lamps provide for the storage of a quantity of magnesium near a flame, since the magnesium will not ignite or burn until it is blown through the flame; whereas flashlight compounds are all more or less explosive, and must not be brought near to a flame or any form of heat until the actual moment of making the flash.

Several reliable lamps for use with plain magnesium powder may be found in the catalogues or seen at any dealer's.

Efficiency of Magnesium

The efficiency of the magnesium flashlight depends not merely on the quantity of magnesium used for the flash, but largely on the thorough and complete combustion or burning of the powder. To secure this, see that the powder is in good condition before use, and that the air pressure giving the flash is smooth, steady, and continuous, not violent or jerky in its action, so that every particle of powder blown through the flame will be wholly burned and turned into actual light efficiency. When fresh and dry (as it should be) magnesium powder is even in its fineness and free from lumps or large particles, with a brilliant silvery sheen. If oxidized by exposure to air or age, it has a dull, grayish appearance, and in this state does not burn so readily or so brightly as when dry and fresh. Insist on fresh powder and keep in a securely corked bottle to prevent oxidation. If it has become caked or damp, and shows large particles, heat it on a warm plate before use until it is thoroughly dry, and rub it down to smoothness with the ball of the thumb. Before charging the reservoir of the lamp, see that the bore or passage of the rubber tubing, and the metal connections leading into and out of the reservoir, are free and not clogged with magnesium or dust. When making the exposure, give the bulb a quietly increasing, continuous pressure, so that the powder is sent through the flame evenly and steadily.

Burning Magnesium in Oxygen

The intensity of the light given by magnesium powder may be largely increased, as already mentioned, if a stream of oxygen is used in place of air in blowing the powder through the flame of the lamp. This is more simply accomplished with powdered magnesium than with the ribbon form. Those who have had any experience with the oxyhydrogen light in lantern work will find no difficulty in this suggestion. Having a cylinder of oxygen at hand, remove the rubber bulb from the flashlamp to be used, and make a connection with rubber tubing between the magnesium chamber of the lamp and the nozzle of the cylinder (or regulator). A chemist's spring clip should be used to pinch the tubing halfway, or it may be divided in the middle and

joined up again on a small double-ended stopcock. The lamp being charged with magnesium and lighted, the cylinder is turned on, a simple pressure of the spring clip, or a quick half-turn and back of the stopcock will give the flash. The exposure here is regulated by the length of time the oxygen is allowed to act, but it is unwise to give too long a flash by this method, as the intense heat generated by the oxygen, if kept going many seconds, will probably fuse the metal holder of the lamp. This method is peculiarly useful in photographing children, as by increasing the length of the tubing, while having the stop-cock or spring clip at hand, the camera and lamp may be operated at any desired distance from the subject. Similarly, by using a small four-way brass connection with the cylinder, and three lamps connected with the cylinder by rubber tubing—each piece of equal length—this method can be applied to give three simultaneous flashes for large groups or interiors. I have seen a dinner group of two hundred persons made by this method, which was equal in quality to anything of the kind made with flashlight compounds.

Suggestions re. Exposures

It is admittedly difficult to give precise information about exposures (or amount of powder needed) with magnesium. This will depend on (1) the character of the subject and the color of the surroundings; (2) the distance between the subject and the flashlamp; or, in the case of an interior or large group indoors, on the size of the room; (3) the rapidity of the plate used; and (4) the speed of the lens. Taking these last two factors as fairly constant, viz: a rapid, backed plate or film, and a lens working at f/8, a few suggestions may be made which will prove helpful to the beginner.

Portraits: Groups

For portraits, the lamp should be fully charged and the air-pressure regulated to give a flash of one-tenth second up to four seconds, as the subject may require. Some subjects will not stand more than the quickest possible flash, i. e., one-tenth of a second, or a short, quick pressure of the bulb. A bust portrait of a child in a white dress at five feet from the lamp will not need more than this.

A woman seated, wearing a dark costume, with the normal surroundings of a home, will need an exposure of four seconds. The illumination of the shadows in such a subject should be helped by the use of a sheet or other reflecting screen, placed as near the subject as possible, but outside of the field of the lens so that it will not come into the picture. A group of six or eight people at table, with the ordinary illumination of the room or table, and the flashlamp at eight feet away, will require from four to seven seconds' exposure. A teaspoonful of magnesium powder will be sufficient for a small bedroom showing a child asleep in its crib, if the room decorations are light in tone; if dark or heavy in tone, take two teaspoonfuls of powder. A few trials, however, will give the reader a better idea of the requirements in his particular circumstances than a bookful of suggestions. I have secured very satisfactory pictures of room corners, with a Christmas tree lighted, by using a flash of ten seconds and, after the smoke had cleared away, burning a few inches of magnesium ribbon (carefully, to avoid fire) under the heavy, lower branches of the tree or behind it.

Interiors

For photographing interiors with magnesium powder, where time exposures may be made, I reprint the useful table by Mr. J. H. Crabtree (Photographic Monthly, March, 1906) which is based on his extensive experience. The method of placing the flashlamp and the general arrangements for picture-making with magnesium powder do not differ materially from those employed with flashlight compounds, to be described in the following pages, so that I need not detail them here. In closing this section, let me repeat that the peculiar advantages of magnesium powder and ribbon, wherever they can be used for flashlight work, are their safety and freedom from danger in handling and their convenience coupled with a wide range of usefulness. Let me repeat, also, the warning. Never use a flashlight compound or mixture in a lamp intended for magnesium only. Use magnesium in a storage lamp, with a blow-through device, and flashlight compound with an open lamp, ignited by taper, fuse or electric spark.

Crabtree's Table of Amounts of Magnesium Powder Required to Photograph Rooms of Various Sizes, with Fairly Rapid Plates and a Lens Working at f/11.

Distance of main object	Relative size of room			Grains of magnesium required
	Length	Breadth	Height	
Feet	Feet	Feet	Feet	
9	15	6	10	15
15	20	6	10	30
20	25	10	10	75
25	30	12	10	120
30	35	12	10	180
35	40	15	10	230
40	45	15	12	300
45	50	20	12	370
50	60	20	12	460
55	65	20	12	560
60	70	30	15	680
65	75	30	15	780
70	85	30	15	900
75	90	40	15	1,020
80	95	40	15	1,200
85	100	45	20	1,340
90	120	45	20	1,500
95	125	50	20	1,650
100	130	60	20	1,850

Flashlight Compounds

There remains to be considered the use of flashlight compounds, the modern form of the flashlight, generally used in America today. These are commonly known as "flashlight powders," being sold under a variety of trade names, and in several different forms, viz.: in bulk, as powder; and in fixed quantities, calculated to give definite amounts of light, as flash sheets, flash cartridges, flash envelopes, etc. Each form has its own advantages for different purposes, the measured quantity device being especially convenient, as doing away with measuring, mixing, or otherwise handling the powder before actual use. The use of this form has increased of late years and will doubtless become general for all flashlight work.

What Are They?

Every manufacturer claims that his particular brand of powder is indisputably superior to all others. With these claims we are not here concerned. What we seek to know is: In what does a flashlight compound differ from plain magnesium? What are the practical advantages of flashlight compounds as compared with plain magnesium? And how are compound powders used? If I can answer these questions, the reader will find no difficulty in choosing the particular brand best suited to his needs, or in using it to secure the advantages offered by the flashlight in photography.

Their Advantages

First, then, there can be no doubt about the greater efficiency of flashlight compounds, as compared with plain magnesium. As already mentioned, these compound powders are mixtures of magnesium with various substances rich in lightly combined oxygen, such as potassium chlorate, perchlorate, permanganate, persulphates, and the nitrates of rare earths, thoria, ceria and zirconia. All such compounds, by this addition of oxidizing agents, differ from plain magnesium in that: (1) they ignite more easily and are more readily consumed; thereby (2) giving a greater amount of light or actinic value, with a more rapid flash; and (3) they produce less smoke. Incidentally, by choice among the various oxidizing agents available, it is possible to materially modify the color of the flame, so that some compound flashlights give a softer light than plain magnesium, while others act somewhat like a color screen or filter, thereby giving a more truthful rendering of the color values in subjects which exhibit colors. This color-value difference in compound powders is especially noticeable in color portraiture with Autochrome plates, giving warmer or colder, or richer or duller colors, according to the composition of the powder used.

More Light Less Smoke

It results that flashlight compounds are more convenient and more economical in use than plain magnesium, a much smaller quantity of the compound being required for the exposure in a given case. Thus 5 grains of compound will give as much light, or as full an exposure,

In Arden Forest, California
Edgar A. Cohen

Path Through Mill Canyon, California
Edgar A. Cohen

as 50 grains of magnesium. Again, because of the small quantity of powder required, the volume of smoke following a compound flash is about one-tenth that accompanying the magnesium flash. Compound powders also give a more rapid flash than plain magnesium, the duration of the former being 1-30 second (reaching maximum intensity in 1-120 second) as against 1-10 second with the latter.

More Rapid

These differences mean very much more in actual practice than is apparent from a bare recital of the facts. In portrait work, for example, experience proves that any flash which exceeds 1-12 second in duration, will usually give the sitter's eyes closed (from the momentary glare of the flash) or fixed in a rigid stare. In this use, also, the amount of plain magnesium required to give a quick exposure to offset possible movement gives off a troublesome volume of smoke, which is inconvenient, whether in the studio or at home. Hence for children or nervous persons, for photographing animals, or any subject including possibility of movement, the use of magnesium is practically out of the question.

Gain in Exposure

With compound powders, on the other hand, one is certain that any movement in the subject during the flash (exposure) cannot spoil the picture. Thus, with compound powders, photographs have been made of indoor athletic sports at night, of animals in natural movement, such as kittens and puppies playing in the home, and remarkable portraits of children, full of life and sparkle. In some of these instances the exposure did not exceed 1-500 of a second, and the charge of compound powder was about 5 grains, obviously, too, the amount of smoke following such charges is negligible, and permits of repeated flashes quickly following each other, which is not possible with plain magnesium.

Gain in Color Work

It is apparent that these advantages apply with equal force in many other branches of photographic work, where rapidity of flash and light penetration, with comparative freedom from smoke, mean all the difference between success and failure. Thus the greater actinic power of

the compound permits of practical exposures with orthochromatic plates and color filters in photographing colored objects. This is very important in color portraiture where the comparatively slow Autochrome and Paget color plates and special filters are employed.

Other Advantages

Similarly, the fact that a compound powder can be used without a lamp, by simply spreading it in a train or loosely in a metal pan, enables one to do successful work with it underground, in tunnels or other construction work, where the use of cumbersome, multiple-lamp systems needed for plain magnesium would be impossible. Finally, the handling of compound powders has latterly been so thoroughly developed by the introduction of special flash lamps, flashbag systems and other auxiliaries, that one may use these with a simplicity of method and certainty of results unobtainable in the use of plain magnesium powder.

The Big Drawback

These big advantages, however, are accompanied by a very positive drawback, viz.: all flashlight compounds are necessarily explosive powders, and there is the ever-present danger of accident in their use. It is true that, with a very little carefulness—constant and unforgetting carefulness—this danger is theoretical rather than practical. But the risk is always there and, human nature being what it is, every year has its crop of flashlight fatalities and accidents.

Danger of Compounds

Doubtless the commercial specialist, who has used these flashlight compounds for years without mishap, will pooh-pooh more than the merest mention of this danger. Manufacturers of flashlight compounds, too, are wont to complain that the risks incidental to the use of their preparations have been grossly exaggerated and too strongly emphasized. But against this complaint we can set the large percentage of manufacturers of flashlight powders, who have paid the penalty of death, or suffered grievous injuries from flashlight accidents. In any event, it is certain that this known risk of personal injury deters many from the use of flashlight powders.

What the Records Tell

Let us look at the facts for a moment. The records plainly show that most of the accidents ascribed to the flashlight have occurred in the preparation or mixing of compound powders. Thus their manufacture is properly classed among the "extra-hazardous occupations." For which reason, by the way, no formulas or directions for the making of flashlight compounds will be given place in these pages.

Carelessness

Of the accidents attributed to the use of flashlight powders, as distinct from their manufacture, the majority are shown to have been the result of gross carelessness or mistake on the part of those who knew that they were handling a highly inflammable and explosive compound. Thus we read of one who kept his flashlight powder, for convenience, in a pepper sprinkler, and lost a perfectly good cook when that poor unfortunate used the sprinkler to season a dish preparing on a hot stove. Others have been known to dry out damp flashlight powders in a hot oven; or have tried to loosen badly caked powder in a bottle by vigorously poking it with a steel knife; and others again have persisted in smoking cigarettes while measuring out flashlight charges.

Things to Remember

There is no reason whatever for denying oneself the very remarkable advantages offered by flashlight compounds in all sorts of photographic work. But it should always be remembered that they are highly inflammable and explosive, should be kept away from heat or flame, and handled with the same care one gives to gunpowder, benzine and matches. Remember, too, that some flashlight mixtures ignite and explode by mere friction or concussion, such as the careless grinding of a stopper or screw lid in removing the powder from its container, or the dropping of the container on the floor. The use of measured charges, i. e., cartridges, envelopes, etc., is therefore safest as well as most convenient in handling.

Simplicity in Use

A simple but effective way of using flash powder for the occasional requirement, or to test its possibilities, without a lamp or other apparatus, and with no trouble what-

ever, is to sprinkle say half-a-teaspoonful of powder on a small piece of fluffy cotton (or, better, put the powder in the center of a piece of tissue paper four inches square, and loosely twist the four corners of the paper together to form, as it were, a bag containing the powder). This will form the charge, which is now placed on a dustpan, or the lid of a tin biscuit box and is ready for use. Having arranged and focused the subject, which may be a small room interior, or a group of three persons, or a head-and-shoulders portrait of a friend, place the dustpan and powder (or hold it) well above the camera and at one side; open or uncover the lens, and ignite the powder by applying a match or lighted taper to the cotton or twisted tip of the paper bag. The flash will follow instantly, and you should have a fully exposed negative of the subject. Close the lens immediately after the flash. Let the ordinary lights of the room burn as usual during these operations, watch for the most favorable moment for the flash, and avoid looking (or letting your subject look) at it during the exposure.

Refining the Method

If this first simple trial gives a satisfactory negative, as far as the exposure and general illumination of the subject are concerned, any desirable refinement in method may be adopted in succeeding experiments. Thus, if the lighting is harsh and the shadow side of the subject is insufficiently lighted, place a white reflector at one side of the subject to throw light into the shadows, and devise a screen of muslin, cheesecloth or tracing-cloth to stand or hang between the subject and the flash pan, to soften and modify the illumination given by the flash. If this screening of the light results in under exposure, use a slightly larger amount of powder, or place the flash-pan nearer the subject—always keeping it, however, where the light of the flash will not shine into the lens or come within the field of view. Take care, always, that no inflammable curtains, draperies or screens are near to the flash, remembering that the flame flares or spreads at the moment of ignition. If the light reaches the subiect from too low a point to give a pleasant expression or desirable modelling, elevate the flashpan, and so on as the case may require.

On a Santa Cruz Mountain Road, California
Edgar A. Cohen

Up Topanga Canyon—Los Angeles, California
Edgar A. Cohen

This is a rough-and-ready method, but will give good results if used intelligently. The same method is used for many subjects in commercial photography, but, of course, the work is on a larger scale, as where a trail of flash powder was spread on newspapers across a subway tunnel to photograph the progress of construction, giving a flame twenty feet in width and five feet high, flooding the tunnel with light for approximately three hundred feet and yielding a fully exposed negative.

Flashlight Apparatus

The more practical, convenient and efficient method of flashlight photography, however, is to use the compound powders in a flashlamp, or in one or other of the fixed-quantity devices, such as cartridges, envelopes, flash-sheets, etc. This method eliminates much unnecessary handling of the powder, cuts out waste, is simpler in serious work than the rough and ready method, already outlined, and offers more certainty in results. There is available for this method a large variety of flashlamps and apparatus, with abundant choice for every need and preference, costing from seventy-five cents for a simple hand lamp, to seventy-five dollars for a studio flashlight outfit. Flash sheets, cartridges and other fixed-quantity forms may be had from a few cents per dozen upward, according to their capacity.

Flashsheets

For the beginner who desires to make portraits at home, or small groups or interiors, or as a supplementary light in daylight portraiture about the home, the most convenient form of flashlight is the flashsheet or small flash cartridge. Flashsheets are simply pinned to a wooden lath tied to the back of a chair or other support, or may be used in the special flashsheet holder supplied by the makers of the flashsheets. They come in three or four sizes and are sheets of paper coated with flashlight mixture, giving a short, brilliant flash when ignited with a match and being wholly consumed by the flash. The proper size of the sheet to use depends upon the subject or work to be done, and the commercial holder is the safest and simplest way of handling the light. Instructions are supplied with both sheets and holders as to their proper use.

Cartridges, Without Lamp Next in order come cartridges and capsules containing a fixed quantity of flashpowder, fitted with a slow burning fuse. These are suspended from a nail on a wall, or from a chandelier or other gas fixture, or attached to a stick of convenient length for the purpose in hand. In capacity they are graded to give a definite amount of light, or to properly illuminate a given space, so that in their use one is always assured of uniform illumination of the subject. The manufacturers' instructions, as supplied with the powders, are full and explicit. Needless to say, both flashsheets and cartridges used with or without a lamp, should always be kept away from the person or nearby draperies.

With Hand Lamps It is possible and preferable to use cartridge flashlights in a holder or small hand lamp, of which there are many in the market. Some of these holders provide a convenient shield behind the light, which is a decided advantage over the open lamp when the light is held in the hand. Both holders and lamps are obtainable in different sizes, and for most amateur flashlight work these will be found amply sufficient to cover all requirements in working at home. There are also many different forms of flashlamps for the use of loose powder. Some of these bunch the light and others spread the flame over a comparatively large area, each claiming special merits for different purposes. Among these are both hand and stand outfits of varying capacity.

The Flashbag System A still more cleanly and efficient method lies in the use of a flashlamp with a flashbag, which latter is simply a balloon-shaped bag of white fireproof material, often arranged over an umbrella frame, and so made that the opening at the bottom of the bag can be tightly closed about a spool, or with a string, after the flash. By this method the flash is made inside the bag, which diffiuses the light, thus doing away with the necessity for a screen, and entirely eliminating the smoke nuisance by confining the smoke in the bag, which may be emptied out of doors after each flash, or allowed to settle as dust and then removed from the bag.

Its Advantages

The advantages of this flashbag system are obvious. It was formerly designed for commercial work, large interiors or groups at social gatherings, etc., but is equally adapted for home or studio work, color portraiture, etc., and flashbags for these purposes are now available. In some flashbags, the flashlamp is attached to the back of the bag, which is suspended during use at any convenient part of the room. In others, the flashlamp is held on an iron standard, so that the apparatus may be used at any convenient height from the floor. This latter is the most convenient form for portraiture, while the former is better adapted for interiors and large groups. Some bags provide for repeated flashes of small charges of powder without opening the bag, which is an added convenience in home work. Needless to say that this system is just as useful for flashlight work during the day as at night, providing, in fact, a convenient and efficient illuminating method for almost every sort of photographic work, and effectively replacing the earlier use of an umbrella reflector with an open lamp, which presented many inconveniences.

The actual manipulation of a flashbag depends largely on the particular flashbag chosen, and the use for which it is employed. How many flashbags will be needed for a room or group of any given size similarly depends on the flashbag chosen. For these details the reader must depend on the maker of the flashbag he buys. All makers of such systems are very willing to give every possible assistance to their clients, and the instructions for use accompany the goods will usually cover all practical details.

Portrait Outfits

Finally, for studio or at-home portraiture on a professional scale, a variety of special flashlight cabinets or outfits is offered which differ only in convenience of handling and capacity. All that I have seen are abundantly efficient for the work for which they are designed, and the photographer who will familiarize himself with their use will find little opportunity for complaint as to their practical efficiency. There is no

need to go further into details concerning apparatus here, my aim being to inform the reader as to the possibilities of the flashlight rather than to discuss the different forms of flashlight apparatus.

About Plates The advice so invariably given to the beginner in flashlight photography, to use whatever plate or film he is most familiar with, is at once friendly and comfortable. Perhaps it was excusable ten years ago, when the slowness of magnesium and the orthochromatic plates of that time made the two an impossible combination for most subjects. But today that advice is needlessly inaccurate and misleading, and I won't repeat it here, save with the warning that the ordinary rapid plate of commerce is perhaps the worst possible plate one could choose for flashlight work of any sort. Orthochromatic, nonhalation rollfilms and filmpacks are better, as far as their orthochromatic and non-halation qualities go, but even they fall far short of perfection. For flashlight work of the best sort, such as we need in professional portraiture and commercial work, where we have to reproduce the color luminosities of the subject by gradation of tone values, we must use panchromatic plates and an adjusted color filter. This is the honest advice of men who are doing the best flashlight work of today, and it is as valuable to the amateur as it is to the professional. It may involve more difficulty in manipulation, more powder and a little more expense, but these things will not deter those who seek results.

Why Most Flashlight Pictures Displease The reason is plain. The tendency of flashlight workers is to use a flashlight giving the maximum amount of light with the least amount of powder and, of course, a minimum of smoke. This has led the manufacturers of flashpowders to strain every effort to produce compounds of the highest possible actinic efficiency, with the result that most of our flashpowders give a light excessively rich in blue-violet rays. As we know, the ordinary, rapid plate is most sensitive to these blue-violet rays. It follows that the flashlight pictures made with this combination of light and plates are wholly untruthful and lacking in color

values. This explains why most of the flashlight pictures one sees are so generally unsatisfactory and displeasing. Compare the photographs in the theater lobby with the actual scenes on the stage and you will get an unforgettable object lesson on this vital point. Look at the flashlight pictures of public dinners or conventions and try to recall the glow of colors presented at the actual scenes. Ask yourself the question: Why do the photographs fail so utterly to give any adequate reproduction of what the eye saw? The answer is simply that the color values are wholly missing.

The Best Method

This defect is inexcusable. Today we have plates and color filters which will give us almost perfect reproductions of the color luminosities of any subject. And what is more, we have special flash powders which will give us this desirable quality in photographs of colored objects made with flashlight. Make the following experiment and prove this for yourself. Choose for subject a lady, preferably in evening dress with a touch of color—rose, red or yellow for preference. Arrange the flashlamp and camera ready for exposure, and aim to secure a softly brilliant, well modeled lighting of the sitter. Now load a plate-holder with an ordinary rapid plate, and then, in absolute darkness, load another holder with a Wratten & Wainwright or any other good Panchromatic plate, and have at hand a K1 or K2 filter for use with this latter. Make two exposures, the first with the ordinary plate in the usual way, with the proper, normal charge of flashpowder; and the second exposure with the Panchromatic plate and the K1 or K2 filter on the lens. Use twice the normal charge of flashpowder for this second exposure, and be sure that the studio is well cleared of smoke between the two exposures, as the least trace of smoke will give a veil over the Panchromatic plate when developed. Now, in the darkroom, without any light whatever, put the two exposed plates in a developing tray, side by side, flow the developer over them, rocking the tray for a moment to thoroughly cover the plates with developer, place a cardboard over the tray and slowly count sixty. Snap the light on for a moment and examine the two plates,

If development is fairly started, snap off the light, cover the tray and slowly count thirty, after which snap on the light again, remove the tray cover and finish the development and fixing of the plates in the usual way. When the two negatives are washed and dry, make a print from each and compare them. This comparison will be revelation, and it is safe to say that you will never again use the ordinary plate for flashlight work.

Worth the Trouble

This may seem to be a tedious experiment and to involve new difficulties and a little expense. But it will prove to be abundantly worth while. And once equipped for flashlight work along these lines, the decided gain in the quality of your results will amply compensate for the difficulties and slightly increased expense involved. For the amateur who works with films it will be necessary to purchase a plate attachment. Perhaps a better investment would be the purchase of a second-hand plate camera for flashlight work, such as may be obtained at a very small cost; and will be found exceedingly useful for interior work or home portraiture.

The Alternative

Those who cannot adopt this method should, if possible, use non-halation or backed orthochromatic plates, or at least backed non-filter plates in preference to the ordinary plate. In home or studio protraiture with such plates a diffusing screen of pale yellow chiffon or muslin, fireproofed, placed in front of the flashlamp, offers advantages well worth the extra amount (double) of flash powder needed. Where roll films or filmpacks only are available, this yellow screen will prove very useful, but sufficient powder must be used to give soft lighting and full exposures to get tone values.

Amount of Powder

The amount of powder required with different plates and filters varies so widely according to the character and color and depth of color in the subject and its surroundings, that it is impossible to give definite information on this point. The various commercial flash powders also vary considerably in speed. A few experimental exposures, however, will quickly enable the reader to estimate the quantity required for the subject.

With Autochrome Plates In color portraiture with Autochrome plates some of the best results I have seen were obtained with Panchroma powder used with the Panchroma screen—the two being adjusted to work together. Other workers, using the regular screen recommended by the makers of these color plates, have secured wholly satisfactory results with Agfa powder. A few days ago an Autochrome enthusiast, who uses the process only for flashlight color portraiture and finds therein a profitable field, told me that a surprising difference in shades of color may be obtained by the use of different flash powders with these plates. These differences, he said, were especially noticeable in the reproduction of shades of yellow in the hair and costume, and in the flesh tints. The hint is one worth investigation.

Diffusing Screen Where an open flashlamp is used on a stand, a diffusing screen is always desirable to soften the glare of the flash and to obviate a too abrupt or harsh illumination of the subject, whether it be portrait, still life, or an interior. Such a screen may be of white muslin, cheesecloth, or architect's tracing linen. As the screen is used in fairly close proximity to the flash, the fabric should be fireproofed. This is done by immersing it in the following solution: Dissolve ammonium phosphate, 5 ounces, and common soap, 2 ounces, in 90 ounces of water. Let the fabric soak in this for half an hour at 120° Fahr. then allow it to drip and hang up to dry, stretching it on the frame of the screen while slightly damp. This mixture, by the way, will serve to fireproof flashbags, and the fireproofing should be repeated after every five or six exposures—first washing the bags thoroughly.

Reflectors Reflecting screens, to throw light into the shadows of the subject, are even more necessary in flashlight than in daylight portraiture, since the flashlight is more concentrated in direction than daylight. Such screens or reflectors may be of white sheeting, or white card, or even a newspaper will serve. They should be placed so as to reflect light where it is needed to soften the shadows of the portrait, or to help in securing a more effective

modeling of the face, always remembering that they must not come within the picture space. The most useful form of reflector is one which, stretched on a light framework, is fixed to swing, so that it can be tilted or inclined to throw the light upward when this is desired.

Beginning Practical Work

We have thus far considered the various forms of flashlight, their relative efficiencies, methods of handling, and the equipment required for their use. Having thoroughly digested this information, the reader should now find little practical difficulty in making a successful beginning in flashlight work. I have purposely devoted the larger proportion of my space to this detailed account of the flashlight and its possibilities, rather than to instructions telling how to do this or that with the flashlight, for two reasons:

First: there is or should be, no practical difference between photographing by flashlight or daylight. Once it is realized that in the flashlight we have a source of light sufficient for any photographic purpose, uniform in quality, and always completely controllable, it becomes apparent that we should use it just as we use daylight. As a matter of fact the flashlight is simpler and more certain in use than daylight as soon as we familiarize ourselves with the details of its handling, whether we use it at home or in the studio, by day or at night. This follows because the flashlight is so completely within our control, so easily regulated and adaptable, and so invariable in its light power or efficiency. All that is necessary is to arrange the subject in the usual way, whether it be a portrait, group, genre, interior, machine or anything else, study the scheme or direction of lighting which will best reproduce the effects desired in the photograph, place the flashlight equipment in a position to give this illumination, focus the subject, open the lens, and fire the flash. There are, of course, modifications in the detail of the method. It is not daylight, but a very effectual substitute for daylight, and we have to familiarize ourselves and adapt our methods of working to these differences in the two light sources.

Second: there are practical difficulties in giving instructions which will be really useful to the worker

In the Hills, California — Edgar A. Cohen

with flashlight. To be of practical help, these instructions should go into minute detail as to the subject, the surrounding conditions, the flashlight equipment and particular method employed in dealing with the subject. Where the subjects are so variable in character, and the conditions so rarely alike as in photography; and where the flashlamps, flashpowders aud other details of equipment differ as largely as they do, any general instructions must necessarily fail to be be effective. In spite of which I propose, in the following pages, to give some account of flashlight practice from my own experience and that of others, simply for the suggestive value this information may have for the reader who may have had no previous experience in flashlight work.

Portraits

The professional reader, of course, needs no special instructions as to the use of the flashlight in portraiture. Having made sure of the efficiency of his equipment, whether studio flash cabinet, flashbag system, or open stand lamp, and being familiar with its manipulation, he will use it just as he uses his skylight, employing the light at various heights from the floor, and at different angles from his sitter, to secure just the light effects he desires in each case.

For the amateur, or in home portraiture, the position of the light is of chief importance, as determining the style or kind of lighting. If the amateur has had any experience in window lighting by daylight, he will find this immensely useful in his flashlight portraiture, since he will know what to aim for, and how this or that light effect is secured.

Three-quarter Lighting

As a general rule for the average head and shoulder portrait, the light should be placed three feet above the sitter's head, two or three feet in front, and three feet away at one side. To make this plainer, suppose the head of the subject to occupy one of the lower corners of an imaginary square; then place the light well above, in front and at one side of the head, at any point on the diagonal line drawn from the head to the opposite corner of the imaginary square. The camera, of course, will face the subject, the head of the sitter being slightly

turned away from the light if the usual three-quarter-face view lighting is desired.

"Rembrandt" Lighting

By placing the camera on the opposite side of the subject, so that the light strikes the side of the face away from the camera, the so-called Rembrandt, or shadow lighting, is obtained. Another method of obtaining this lighting is to place the subject about four feet away from a dark background, shoulders turned one-third toward one side so that the head is almost in profile. Place the lamp four feet to the side, eighteen inches behind the subject, and thirty inches above the head. Use a diffusing screen between light and subject. With the lens at $f/8$ about fifteen grains of flashpowder should be sufficient in this case. The amount of powder needed depends on the distance of the subject from the light, the character of the subject, and the rapidity of the brand of powder used. In some instances, the makers of flashpowders offer cartridges, envelopes, or other fixed quality devices which automatically give just the amount of light required for the average portrait.

Silhouettes

To make flashlight silhouettes, tack a sheet in a doorway or opening between two rooms and focus the subject in front of the sheet, about three feet away. If the sitter will hold a lighted taper behind the face this can be sharply focused. Place the flashlamp, or a small pile of powder, say, a spoonful, on a dustpan, about four feet away from the sheet, in the other room or passage. Open the lens and make the flash.

The simplicity of this method suggests its use as a profitable side line at fairs, bazars, etc., or as a studio novelty for the professional. Thus, fix a permanent background of white sheeting in front of a portable box arrangement resembling the familiar Punch and Judy show. Keep the flashlamp in this box, which should have a flap-covered opening behind to allow for recharging the lamp, and a flexible flue to carry off the smoke. Positions for lamp and sitter should be fixed to give the correct focus as soon as the subject is seated, and the exposure made, when ready, by means of a rubber bulb and tubing of convenient length or the use of a fuse.

Variations A pleasing variety of this lighting is to use an old sheet as described, save that directly behind the subject's head a round hole, about two or three inches in diameter, is cut. Place the lamp directly behind this opening and ignite about ten grains of powder. This gives the profile lined by light with a halo about it, and is very effective. Another variety of the same effect is secured by using a dark ground pierced as described.

Firelight portraits, with very pleasing poses and light effects, are easily made by flashlight. Arrange the figure, or it may be a group, around the fireplace and focus carefully. When ready for exposure an ordinary flashlight cartridge or flash sheet placed and ignited in the empty grate will supply the light. In the case of a single portrait so made, see that the light itself does not come within the picture space. In the case of a group seated about the fireplace, see that one of the figures comes directly between the lens and the light.

In all flashlight work done at night, the usual lights of the room should be left untouched unless they happen to come within the field of view. This lessens the momentary shock when the flash is made and helps the subject to preserve the natural, unconscious expression at the moment of exposure. For head-and-shoulder portraits the flashlamp should rarely be lower than seven feet from the floor, although this will necessarily be regulated by the height of the subject and the style of lighting desired. For full-length figures the light should be higher, viz., eight or nine feet from the floor. The commonest fault in all amateur flashlight work is placing the light too low.

As a rough guide to the amount of powder required, the following quantities will usually be sufficient for a plate of normal rapidity (H & D 200) and the lens at *f*/8; at 5 feet from the subject, use 10 to 15 grains of powder; at 10 feet distance use 30 grains of powder. If the subject wears clothing light in color, or white, and the surroundings are not dark and heavy in tone or color, these quantities may be reduced by one-third. For groups of from five to twenty persons, about one-third more will be required.

Home Groups Small home groups of three and four persons offer many alluring opportunities for picture making at home during the long winter evenings. Even with the most modest flashlight outfit the photographic part of the work presents few, if any difficulties, the success of such groups depending chiefly on the use of a little forethought in planning the affair, and the photographer's ability to control his subjects. The aim should be to secure pictures showing the group busied with some or other of the occupations or pleasures of the home. For examples: children at supper; a card party; young people grouped about the piano or phonograph; a friendly game of pool or checkers; or a mother reading fairy stories to her children.

Select the most favorite location for such a group and roughly plan out a pleasing arrangement of the figures before attempting any work with the camera. Have the camera ready in every detail for focusing and exposure. When the favorable moment comes and you have the group at hand; place the camera about ten feet away, where it will give a desirable view of the group and its activity at the time of photographing, and see that all the figures are happily arranged within the picture space. Put a plate or film ready for exposure and stop the lens to *f*/16 (or *f*/8 if you have an anastigmat). Place the flashlight about three feet at one side of the camera and in line with it, at such a height that it (the light) will be twelve or eighteen inches above the head of the most distant figure. Hang a sheet or other reflector as near the group as is possible without the sheet coming into the field of view, to soften the lighting and throw light into the heavier shadows of the composition. Use a charge of twenty-five grains of flashpowder for a plate or film of ordinary rapidity; or fifty grains if a lens filter or diffusing screen is used; and make the flash at just the right moment to get the group unconsciously busy with whatever occupies its attention at the time.

The amount of powder will vary with the circumstances. A group of children in white dresses, seated at a table with the usual white napery and table illumination, will need only fifteen grains; while a group of

young girls in dark-colored dresses at a piano, or of men playing with cards or at a pool table, will call for the full charge of twenty-five grains of powder.

Commercial Groups For larger groups of say, thirty persons, such as a lodge meeting, directors conference, or small class groups, the lamp used should have a capacity of one-half or three-quarters of an ounce of powder. Sometimes two lamps will be required. In this work the flashbag system has very practical advantages, giving a broad diffused lighting without the smoke nuisance. The lamps may be mounted on light metal standards or suspended, one at each side of the camera, which will usually be placed at one corner of the room. One lamp may be charged with half an ounce, the other with three-quarters of an ounce of powder, the smaller one being fixed at seven, and the larger one at ten feet from the floor. Since the two flashes must be simultaneous with the opening of the lens or shutter for the exposure, the lamps and shutter must be electrically or pneumatically connected. There is an attachment of this sort in the market which permits one to test the current before the flash so as to avoid any failure at the critical moment of exposure. The flashbag method also permits of the use of a hand lamp where this is sufficient for the purpose. Other flashbags are used with the old form of standlamps using loose powder, while others, again, are operated with cartridges, these being the more convenient.

Portrait Outfits A novel equipment, recently introduced, provides a small, boxed studio light for home portraiture, fitted with an electric proof-light device which permits one to see and adjust the illumination of the sitter before the flash. This outfit also has a banquet bag attachment, suitable for halls and groups up to sixty persons.

Another recent introduction combines a flashlamp and smoke-bag, for hand use, in the form of a box, giving a light area of about eighteen by twenty-four inches. This outfit, light in weight and collapsible, should prove very useful for professional work away from the studio.

For studio portraiture and small groups there is

available a flash cabinet, which gives a series of twelve flashpans in a swinging light-box offering a light area 46 x 56 inches, covered with tracing linen. A separate electric light system is included with the outfit for focusing and adjusting the lighting of the subject. The exposures with this cabinet are controlled by the length of the flash, ranging from one-fortieth of a second to one second. I am told that it has proved so efficient in practical work that many photographers are using it exclusively in their studios for all sorts of portraiture, including groups up to 11 x 14.

Banquet Groups

Flashlight banquet group work, which includes every sort of big gatherings, public dinners, college classes and commencement exercises, club meetings and convention groups, offers a very profitable specialty for the professional worker located in a large city. The negatives in this class of work are usually 11 x 14, and the flashbag system is used almost exclusively, several flashbags, each containing a charge of one ounce of powder, being disposed in the shape of an L along one side and end of the hall. The number of flashbags required depends upon the size of the hall and the "spread" of the crowd to be photographed, varying from four to ten flashbags. A camera of special construction for this kind of work is now available, which can be operated quite close to a wall or in a corner (which is often necessary for lack of working space in the foreground), and which includes a wide view angle on a long narrow plate. The lamps used are, of course, electrically connected and fired by the operator at the camera when he opens the lens. The manipulation of this system is very simple when once the bags have been placed and connected, which is done before the actual time of photographing the group. The selection of a suitable equipment calls for some forethought and consideration, so that it will be adequate for its widely varying requirements. The makers of these flashbag systems, however, are very willing to give full information and expert assistance to those taking up the work, both as to the number of lamps required and the amounts of powder necessary for successful results.

Finis Into the many other commercial uses of the flashlight I am unable to enter, having already exceeded the limits of my space. The principles on which these applications are based are, however, substantially similar to those outlined for group work, and may be reduced to these three essentials: (1) the choice of a viewpoint which will best illustrate or portray the subject; (2) the use of an open lamp or flashbag system with a compound powder, or a powerful storage-lamp system using plain magnesium, according to the circumstances of the place; and (3) the use of sufficient flash material, whether magnesium or compound, to give a fully exposed plate. For the development of every sort of flashlight exposure, the use of a well diluted, slow but sure density-giving developer such as rodinal or glycin is generally employed, with the tank system for all negatives under eight by ten inches.

Acknowledgment is made of the very practical help and information given, in the preparation of this handbook, by Mr. J. Wesley Allison, whose skill and inventions in flashlight photography are well kuown.

JOHN A. TENNANT.

Notes and Comment

It may interest my readers to know that there exists, in sturdy life, a Photographic Publishers' Association of America, which includes in its membership, with three exceptions, every photographic journal published in this country. "House organs" or journals published by manufacturers or dealers in photographic supplies are, of course, not eligible for membership in the P. P. A.

The purpose of this Association is to cultivate a wider use and popularity of photography in America, by steadily improving the service its members give to the almost three million photographers, amateur and professional, who buy and read the journals published by its membership, as well as the important service rendered to the three hundred or more manufacturers and eight thousand dealers in photographic apparatus and supplies. A service such as this, which embraces every photographic activity, should undoubtedly have a large influence upon American photography. And, without a doubt, this influence is more advantageously employed by the union of its agencies than it could be by the individual effort of any single member of the union.

To promote its greater efficiency and to harmonize the work of its diversified membership, the members of the Photographic Publishers' Association have agreed to adopt for their papers the "Standard of Practice" adopted by the principal class journals of the United States at the recent convention held at Toronto. This "Standard of Practice" is to go into effect among the photographic papers comprising the P. P. A., January 1, 1915. Its ten principles are as follows:

1. To consider, first, the interest of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal

opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.

4. To refuse to publish "puffs," free reading notices or paid "write-ups," to keep his reading columns independent of advertising considerations and to measure all news by this standard, "Is it real news?"

5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.

6. To solicit subscriptions and advertising solely upon the merits of the publication.

7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements subject to proper verification.

8. To coöperate with all organizations and individuals engaged in creative advertising work.

9. To avoid unfair competition.

10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

THE PHOTO-MINIATURE has steadily adhered to these principles, and some others, since it first appeared in 1899, without waiting for the rest of the world to acclaim them. Hence THE PHOTO-MINIATURE has no hesitation whatever in telling its readers of its formal endorsement of this "Standard of Practice," in union with its fellow members of the Photographic Publishers' Association of America.

The Ensign-Popular Reflex Camera is fast winning as wide a popularity here as it has already reached on the other side of the Atlantic. In compactness (lack of bulk and weight) and efficiency, with every modern movement making for convenience and certainty in operation, the Ensign-Popular Reflex has big advantages which deserve looking into. In dimensions it measures 6½ inches in every direction, over all projections, and its weight, with lens, is under four pounds. The self-erecting and focusing hood has a comfortably

shaped, narrow, light-excluding eyepiece, so that one can view the picture without burying the face, and its narrowness enables one to see the image even in a strong light, at waist-level or overhead. The mirror, caved sky-shape, and rising and falling front have each their peculiar advantages in construction. The lens is the Carl Zeiss Triotar f/14.5, and the exposure shutter blind is self-capping, with approximate speeds from 1-15, 1-20, 1-25, up to 1-1000 of a second, bulb and time. Although fitted with holders for glass plates, the self-capping blind enables one to use a filmpack without the constant insertion and withdrawal of the adapter shutter between exposures. The camera without lens, but with six single plate-holders and adapter is listed at $42.50, which is a new record in low prices for a reflex camera. With the Zeiss Triotar, the price is $68.

For flashlight and press-photography, or wherever a speedy plate may mean the difference between success and failure, the Imperial Flashlight Plate is a prime favorite among the men who are doing things. The Imperial Flashlight is an ultra rapid, fine-grain plate with a remarkable range of gradation, giving negatives of splendid printing quality. This plate is very largely used by the newspaper photographers of our big cities, because in addition to its other good qualities, it is thoroughly dependable. It is imported by G. Gennert, New York, Chicago and San Francisco.

There are many commercial flashlight powders (compounds) in the market, and their manufacturers are rarely over-modest in their claims as to the efficiency of their particular products. But it seems to be generally agreed among practical workers in the flashlight field that for light efficiency combined with a minimum of smoke and fuss, Agfa Flash Powder is without a serious rival. My advice to the man who attempts flashlight photography for the first time is to use Agfa in an Agfa Flash Lamp. This experience will be sufficient to make him an Agfa enthusiast thereafter.

Talking with a commercial photographer famous for his flashlight work, I asked: "What lens do you prefer for flashlight work?" His reply was prompt, "The Goerz Dagor, of course." "Why 'of course'" was my next question. "Ask any flashlight worker" was the answer. And so it turned out that out of half a dozen men questioned the majority used the Dagor, apparently because of its capacity for giving microscopic detail, its splendid covering power and freedom from distortion in the image. These are all important qualities in flashlight work and the Dagor evidently meets the requirements.

Atlas Roll Film is a new, orthochromatic non-curling film, just introduced by Burke & James, Inc., Chicago, Ill. It has a speed of 180 Watkins, which high speed means fully timed negatives under light conditions which would be prohibited with a slower emulsion. The Atlas film is available in all sizes from the V-P to the largest roll-film hand-camera of any make. After a careful trial of the new film I can, without any hesitation, pronounce it to be equal to any film in the market in speed, color sensitiveness and general quality.

A Memorial to the Late Gustav Cramer

Few men have stood out so prominently in American photography, or have given a more unselfish devotion to the well-being of American photographers, than the late Gustav Cramer, of St. Louis. To honor and perpetuate his memory, whose charities were so many, and whose influence in American professional photography has been so big a factor in its progress during the last quarter of a century, it was suggested, at the Ohio-Michigan Convention of 1914, that a Memorial should be established in St. Louis.

To effect this, Mr. Pirie MacDonald, of New York, called a meeting of prominent photographic workers, which took place in Philadelphia last November. At this meeting were present: Messrs. MacDonald, Ryland Phillips, W. H. Towles, G. W. Harris, Dudley Hoyt, Frank Noble, Frank Scott Clark, L. B. Jones and J. C. Abel.

As a result of this meeting, it was decided to establish this Memorial, and to proceed to collect funds, with the definite purpose of securing the endowment in perpetuity of a room in a St. Louis Hospital, which would be known as the Gustav Cramer Memorial.

Various plans for the collection of this fund were discussed by the Committee at this meeting. The 20th of May being the date of Mr. Cramer's birth, it was suggested that professional photographers desiring to aid the Memorial Movement, should be asked to donate to the fund the amount of their orders taken on that day, May 20, 1915. This method was formally adopted, and all professional photographers are asked to send the following pledge to the treasurer of the fund:

E. B. Core, Treasurer,

76 Landscape Avenue, Yonkers, N. Y.

I agree to send, at the close of business on May 20, 1915, a check equal to the gross amount of the orders received in my establishment during that day, as my contribution to the Gustav Cramer Memorial fund.

Date———— Signed————

It is hoped that a large proportion of the professional photographers of America will send in their pledges to the Memorial fund, as a sum of at least $10,000 will be required for the proposed endowment. Those desiring any further information about the fund, whether amateur or professional photographers, may address Mr. Ryland Phillips, Chairman of the Executive Committee, 1507 Walnut Street, Philadelphia.

Plate I

1 

 2

3 

 4

1. By Albert Teichmann
2. By R. Mocsigay
3. By E. Bieber
4. By E. Bieber

(From *Das Atelier*)

Plate IV

By Brush Studio, Minneapolis

1

By Kate Smith
(From *Photography*)

2

By Paul Schäfer
(From *Das Atelier*)

PLATE VI

By Rudolf Dührkoop

1

By Eastman School

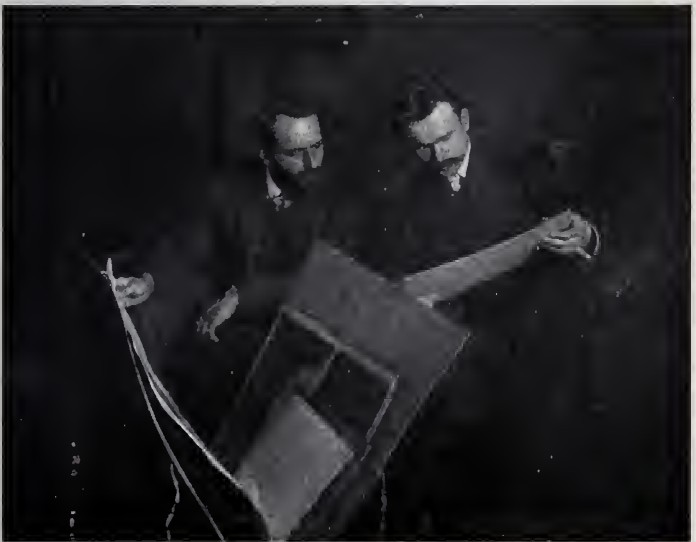
2

By Matzene

By Rudolf Dührkoop

Plate XI

1



2

1. By Wilhelm Weimer
2. By Rudolf Lichtenberg
(From *Die Kunst*)

Plate XII

J. G.

The Photo-Miniature
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Posing the Figure in Portraiture

Without a doubt, the noblest and most excellent use of photography is found in portraiture; the most fascinating, as it is the most elusive, and the most difficult, as it is the most subtle of all the arts; the most interesting, since it is wholly concerned with the supremely interesting theme of human personality—the men and women and children of the world, made in the image and likeness of God.

See, at this beginning of our adventure here, how boldly the excellence of portraiture is written in the high places where men have put those things they treasure most. Take out your reproductions of the works of the great masters in painting and, among all their infinitely varied themes, note how compelling is the interest, how irresistible the charm of their portraiture. Look again at Da Vinci's Mona Lisa; Titian's Man with the Glove; Andrea del Sarto's Portrait of a Sculptor; the portraits of Helena Fourment and the Artist's Sons, by Rubens; Van Dyck's Maria Louise von Tassis and William of Nassau; Holbein's portraits of Erasmus and Sir Thomas Eliot; Philip IV of Spain and Juana de Miranda, by Velasquez; The Two Gentlemen and the Self-Portrait in the Uffizi Gallery by Reynolds; Vigée Le Brun's Marquise de Jancourt; David's Madame Recamier; Raeburn's portraits of James Wardlow and Mrs. Scott Moncrieff;

the portraits of Lady Hamilton by Romney; and a few modern portraits by Sargent, Shannon, Riviere, Cope, and Tuke, not forgetting Whistler's portrait of his Mother. In just what lies their compelling interest and irresistible charm? Precisely in this, that with simple truth and beauty, they portray men and women instinct with life and character, in their habit as they lived. To feel this interest and to respond to this charm in the portrait, whether we find it in the great art galleries or among the chance prints of an amateur or professional photographer, is to have a true appreciation of those indefinable qualities which differentiate each one of us from every other, and which are summed up in the one significant word, personality.

The Portrait

Portraiture is the revelation of personality. Its vital element is likeness, fidelity of resemblance to the subject. Lacking likeness, the portrait fails to fulfil its end, loses its chief interest, and is unworthy of the name. As in everyday life personality is expressed or revealed by the carriage or disposition of the body in action or at rest, by attitude and gesture, in the turn of the head and the use of the hands, as well as in the face and eyes, so in portraiture the quality of likeness is secured by characterization in the pose or an arrangement of the figure and head, and the use of a scheme of lighting or illumination which brings out and gives pleasing expression to what the face and figure tell us of the personality and character of the sitter.

Likeness

In this we have the cardinal principle which should guide the portraitist in all his work. The pose or arrangement of the figure, and its illumination in the portrait, are not things separate and apart, but essential parts of the likeness and the whole alphabet of portraiture. These two parts of likeness in the making of a portrait are usually considered and spoken of together as the pictorial composition of the figure, being closely interrelated and mutually dependent. Here, however, we are going to consider simply the posing of the figure, leaving the illumination of the subject for consideration in a later issue of THE PHOTO-MINIATURE.

A Fallacy There are those who decry any attempt to pose the subject in portraiture as resulting in artificiality and, therefore, destructive of likeness. Among these are many successful portraitists, and their success lends plausibility to their contention. They say: We never pose our sitters, but let them express themselves naturally according to their individuality. It is fatal to attempt any formal arrangement of the subject. Others tell us that skill in the posing or composition of the figure is a gift, an intuition, a matter of feeling or inherent good taste, and can neither be taught nor acquired. There is perhaps more of reason in the latter than in the former view, but both are plainly fallacious when examined in the light of practical experience.

The Answer If we look about us and study the natural, unconscious expression of individuality revealed in the everchanging attitudes or poses of men and women in everyday life, it is obvious that some attitudes or arrangements of the figure are more characteristic than others, and that some are graceful and pleasing as well as characteristic, while others are awkward or less pleasing to the eye. It is equally obvious that some persons are naturally graceful in their movements, whether in action or repose, while others are just the reverse, and the majority apparently quite indifferent to grace or awkwardness as far as their habitual manner is concerned. It will be noted, however that all these classes may be characterized with equal fidelity by a pleasing, graceful or dignified disposition or arrangement of the figure, and that most persons instinctively attempt some such self-arrangement whenever the occasion seems to demand that they look their best. In short, to portray the subject in his or her natural grace or awkwardness of pose may be a sure means of securing likeness, but this, though essential, is not the whole of portraiture.

Nota bene Furthermore, in all good portraits, whether in painting, sculpture or photography, the finer the quality of the portrait, so much the more is it apparent that the figure and its surroundings or accessories were carefully

and skillfully arranged or composed, so as to display the subject or reveal the personality of the sitter in the most pleasing manner. It may be, indeed, that all this resulted from the exercise of good taste and judgment by the artist, the unconscious feeling of what was proper and appropriate to the pleasing portrayal of the personality of the subject. But we may be sure that behind this there was the faculty of seeing and appreciating the character of the sitter, and such a knowledge of pictorial composition as enabled the artist to seize the characteristic and pleasing arrangement of the figure, or to dispose it with good taste and judgment.

Learning to Compose

The purpose of this little book is to explain the elementary principles of pictorial composition as applied in portraiture, not by giving hard and fast rules, but by indicating what effects should be sought for as desirable and what should be avoided as evil. It goes without the saying that this sort of composition is best learned by actual practice, so that, if we had a few models and a well-lighted room at our disposal, the adventure might be more interesting than it can be in these pages. Nevertheless, the composition of the figure by line and space arrangement being largely a matter of form-knowledge—the management of lines and masses within the picture space,—it may be acquired by reading and observation when these are combined with practice. It is, in fact, a matter of self-education, keeping one's eyes open, studying the human figure wherever we find it, and of reasoning out for oneself in what characterization consists, and why this expression of it is pleasing and that displeasing to the cultivated eye. From this viewpoint the composition of the figure, or the pose in portraiture as we commonly speak of it, becomes an absorbingly interesting thing, instead of a laborious striving after impossible or purely artificial ideals, as it is generally supposed to be.

Significance of Line and Form

Composition in portraiture by line and space arrangement is just common sense, applied in the characterization of the sitter by a pleasing disposition of the figure and its accessories within the picture space. The

first step is to realize the significance of the shapes of different bodies when they are bounded or enclosed by lines, such as the outlines of the print or frame. This significance changes according to the shape or proportions of the space within the bounding lines, and is especially influenced by the shape of the spaces between the different parts of the figure and the lines enclosing it. Here we have the common-sense reason why, when we attempt to represent the human figure within a space defined by shape or proportion, composition or arrangement of some sort is necessary if the result is to be pleasing to the eye.

A Practical Lesson

If the reader will keep this in mind and apply it in his work, as the fundamental basis of the pose in portraiture, he will at once begin to eliminate from his work one of the commonest faults in photographic portraiture. To give point to this lesson, let him carefully cut out from an ordinary full figure standing portrait, the figure of an average woman of fifty years or of a girl of fifteen. Now take a piece of cardboard, about 10 x 12 inches, of a quiet brown-grey tone to serve as background for this cut-out figure. Place the cut-out at the center of this background and, by means of strips of white card three or four inches in width, enclose the figure in a series of spaces, each differing from the other in size and shape. For example: place the figure at the center of a square space, with equal proportions of background all around it. Note the effect upon the size and significance of the figure, simply by the lines and spaces within the enclosing boundaries of the strips of white card. Now, moving the strips, give more background space in front of the figure and at the top; or behind the figure and at the base. Let the head of the figure be placed at the center of the space; then slightly below; or higher than the center, and again, near the top of the space, and so on. At each step, study carefully the change in the significance of the lines of the figure in relation to the background space; how the changes influence likeness and individuality or character; how this arrangement is pleasing and that displeasing in effect. This is not composition, but it will serve to show how important mere

line and space arrangement is in portraiture, and how widely likeness and pictorial effect are influenced by the disposition of the figure within the picture space.

The Inevitable

In every disposition of the figure within a space, the result will always be an arrangement of lines and masses or shapes, in which one set of lines or the shape of the mass will dominate the composition. This constitutes the great difficulty experienced by the beginner in portraiture, whether he be a professional or an amateur. He recognizes the actuality of the figure before the camera, framed for good or evil within the bounding lines of the ground glass screen, without knowing what to do in order to secure pleasing effect and likeness in his portrait. Hence the necessity for some definite knowledge of line and mass, and how to manage them in the filling or decoration of the picture space. As he pursues this knowledge by the observation of the figure in life and in the works of acknowledged masters in portraiture, he perceives that composition is construction, the doing of things in order, with certain principles or laws underlying it, and recognized forms or arrangements which, freely followed or adapted in this or that instance, will give these desirable effects combined with characterization or likeness.

Principles and Forms

Among these underlying principles are the ideas of concentration and simplicity, principality and subordination, variety, continuity and unity, and stability or support. Among the different forms available are the use of the vertical line, the triangle or pyramid, the rectangle, and the serpentine or S line, sometimes called the line of beauty. All these, save the last, have to do with the balancing of the composition, an unbalanced composition being as disagreeable as an unbalanced mind. The waving or S line is used to convey the idea of grace or beauty, wherever this is desirable or necessary to likeness, as in portraits of women and children. In group portraits the circular, oval and elliptical forms are employed, as peculiarly adapted to the pleasing arrangement of several figures within a space, a problem altogether different from that involved in the composition of

the single figure. A practical knowledge of these things is essential to the portraitist who seeks to put the vital qualities of likeness and pictorial effect into his work. Lest the reader be affrighted by so formidable an array of principles and technical forms, let me say at once for his information and encouragement, that they embody very simple and practical ideas, with which we are all more or less familiar, and are readily grasped and applied in practical use, once their significance is understood.

Principality

Principality and subordination simply mean that there must be a point of chief interest in the portrait, to which all other parts of the composition are properly subordinated. Usually this is in the face, as in Plates IV, V No. 2, VI and VIII. Sometimes, as in a portrait where the hands are employed, i.e. where the sitter is doing something with the hands, the point of principal interest will center about the action or thing being done, with a close connection between this and the expression seen in the face. We have illustrations of this in Plates II No. 3, V No. 1, and XI Nos. 1 and 2. The proper use of this principle calls for care in the place occupied by the feature of chief interest, which will generally be at a point about one-third lower than the top of the picture space, or one-third of the space from side to side, and very seldom at the center or lower than the middle of the composition or picture space.

Subordination

Apart from this placing of the chief point of interest, the usual means employed in securing principality is by subordinating all lines and masses other than those at or about the principal point of interest. This is especially useful in photographic portraiture, wherein the absence of color naturally gives peculiar significance to line and form. The purpose of subordination is to give less force and attraction to all lines and shapes other than those which lead the eye to the chief interest in the portrait, by which this chief interest is given emphasis and dominance. Its use is well illustrated in Plates I No. 3, II No. 2, IV, V No. 1, and XI. Its non-observance is seen in the undue prominence of the wall picture in Plate III No. 4, and the distressingly obtrusive collar

worn by the man in Plate X. Its proper use calls for such devices as an arrangement of the figure which will show the lines and masses leading the attention unconsciously to the chief interest; a change of the pose which brings this point of interest into greater relief; and the use of a small opaque hand screen to soften the light where it gives overmuch emphasis to any particular line or mass in the composition.

Concentration: Simplicity

Concentration and simplicity are similarly related. To concentrate the interest in a portrait, in order to accentuate characteristics and so preserve likeness, the unessential details of dress and surroundings must be suppressed or eliminated and the lines and masses must be so disposed as to lead up to the point of interest. The lens, as we know, is apt to delineate all the details of the subject with equal prominence and force, the natural result being distraction. By insisting, as far as possible, on simplicity in the arrangement, by softening or suppressing lines and masses which hinder rather than help in expressing the personality of the sitter, we concentrate the attention on what is essential and vital in characterization. In figure composition the simpler the arrangement, the surer are we of success, since everything entering into the composition necessarily adds to the difficulty of securing the proper concentration of interest. It is here that most photographic portraits fail. By the use of elaborate accessories and backgrounds, the photographer introduces a mass of complexity which inevitably leads to confusion. Plate III Nos. 1, 2 and 4, gives us examples of this, with the result that the eye wanders restlessly from point to point. In Plates XI Nos. 1 and 2, V No. 2, and VIII we see the principles of concentration and simplicity applied in a pleasing way.

Variety

The too strenuous following of concentration and simplicity, however, leads to sameness and monotony. This is offset by a judicious use of the principle of variety, which, up to the point where confusion of interest enters, serves to enrich the portrait and stimulate the imagination. It is one of the chief sources of interest

and beauty, and counterbalances the evils of overmuch symmetry and uniformity which too often result from the too close adherence to conventional forms seen in the work of most professional photographers. The charm of the great examples of portraiture by Van Dyck, Rubens, Reynolds and Sargent lies largely in their skilful introduction and use of this principle of variety. Among our illustrations we see it applied in Plates VI and VIII.

Unity

Continuity and unity are closely related to variety, meaning simply that the lines and masses must be connected to produce one harmonious whole. If the lines run in opposite directions, or form abrupt angles, or separate the different parts of the composition, the result is bound to be disappointing, the sense of unity and balance being lost. What we want is a pleasing relation or connection of all the parts in the picture for the complete expression of the dominant idea—in a portrait the personality of the sitter. This is well illustrated in the charming portrait of "Elizabeth in Blue" (Plate VIII) and in Plate V, No. 2.

Stability

The principle of stability or support is equally important in portraiture, since the head or figure, whether in action or repose, must always be well balanced and supported. This applies with particular force when the head or figure is inclined. It is secured by the opposition of lines or the introduction of vertical forms, as seen in Plates I, II, V No. 1, VI, and IX. Sometimes the introduction of a dark space will accomplish the same end, as we see in Plates III No. 2, the coils of hair in Plate VIII supporting the inclined head, and the shadows at each side of the figure in Plate XII. The simplest expression of stability is found in the triangle or pyramidal form, wherein we secure also the qualities of symmetry, grace and variety, resulting from the mere convergence of two lines to a point supported by a horizontal base, as in Plate III, No. 3.

The Vertical Line

Because of its adaptibility to the single figure the pyramidal form has been much overdone, and the reader will do well to strive after the use of other forms as calculated to

give distinction to his work. In posing the standing figure, for example, the use of the vertical line suggests itself as capable of interesting development. It is perhaps better suited to the portraiture of women than of men, because of the severity of the lines in the dress of the average man. The chief difficulty experienced in the use of the vertical line is found in the two spaces between the figure and the sides of the picture space. To overcome this difficulty, see that the figure has more space in front or at one side than at the other, this giving variety of shape or mass. By accessory or the use of shadows (as in Plate XII) tie the figure or connect it with the sides of the picture space to secure the unity of the composition and, at the same time, break the even length of the two spaces. To secure balance, introduce transverse lines in opposition to the verticals formed by the sides of the figure. This may be done by a suitable disposition of the hands, as in Plate I No. 1, Plate III No. 3, and Plate V No. 2. It is also possible to weaken or subdue the force of the principal verticals (of the figure itself) by employing other devices, such as the use of a background mass which merges with the outlines of the figure, the juxtaposing of the shadow side with a shadow, and the introduction of other, subordinated verticals, of which we see an example in Plate V No. 1.

The Pyramid or Triangle

The pyramidal form pleases the eye because of its sense of symmetry and support, combined with variety in unity. The figure, whether head and shoulders only, or half or full figure, disposed within this form, is connected with the sides of the picture space, and the lines naturally flow to the center of interest in the face of the subject. Even where two figures are introduced, a union of two pyramidal forms gives a pleasing arrangement for the same reason. Where possible the attractiveness of this arrangement is enhanced by convexity of outline rather than by the use of concave lines. Plate V No. 2 gives an illustration of this. Attention should also be given to the proportion of the space occupied by the figure within the confines of the picture, and to the shapes formed by the connection of the figure with the bounding lines or frame of the picture space. If the figure is too small

for the space the effect is stagey; if too large it will seem to be cramped, as in Plate II Nos. 1 and 2. An erect figure with the head bent should always have sufficient space above the head to permit it to be raised (in the mind of the observer) without striking the top of the picture space. The modern notion of cutting off part of the head or connecting it with the top line of the picture space is as unjustifiable as it is displeasing.

The Rectangle

The employment of the rectangular form in the composition of the figure is much more common today than it was ten years ago. Perhaps this is due, in some measure at least, to the influence of the work of the Duhrkoops in which the rectangle is often used with great skill and effectiveness. In the use of this form it is well to remember, as Poore explains in his *Pictorial Composition* (which every portraitist should read), that the rectangle is a dependent form, while all the other forms have within themselves the qualities essential to pictorial balance. It is therefore necessary to supply some attraction to balance the isolated measure within the angle made by the figure, otherwise the emptiness of the space will give a sense of incompleteness to the composition viewed as a whole. This attraction may be a light or dark space, or a set of vertical lines, well subordinated in value and just sufficient to hold and satisfy the eye as one gathers in the figure. A small item of balance in the distance is equivalent to a larger one in the foreground, and an isolated object near the edge of the picture space has more attraction than the same object nearer the center. Plate III No. 4 gives us a forcible example of the rectangular form, but the attraction of the item of balance is much too emphatic to give the best effect. In No. 2 of the same Plate, however, the dark vertical mass is in keeping and enhances the effect.

The Line of Beauty

In portraits of women and children the use of the waving or serpentine line is always commendable, as adding the desirable qualities of grace and beauty to the composition. We have an admirable exposition of this in Plate VIII, wherein the painter has used this line almost to excess. It may be seen in all great portraits of beauti-

ful women, such as those by Van Dyck, Raphael, Rubens, Ingres, LeBrun, Reynolds, Greuze, Sargent and many others. For the figure in repose it takes the form of an elongated S, for a figure in action it is shorter and more abrupt, like a Z, or similar to a flame. We see it in Plates III Nos. 1 and 3, IV, V No. 2, VI, repeated again and again in Plate VII Nos. 1 and 2, and in XII. In a remarkable degree this form conveys the ideas of unity and completeness, containing as Poore expresses it "the gist of balance and the essence of grace," and reminding us of Michael Angelo's summing up of its virtues: "wherefore a picture having this form will be most beautiful." It was in praise of this line that Hogarth wrote his "Analysis of Beauty," in which he proclaims it to be the truly renowned proportion, wherein the exact perfection of the most exquisite beauty is found. Certain it is that the portraitist who will cultivate the use of this form will add thereby elegance and distinction to his portraiture of women and win their favor in large measure.

Summing up

Such, briefly put, are the principles and forms underlying the composition of the figure in portraiture. To sum it up in a few words, we have seen that likeness is the chief end in all portraiture, and that the pose is an important part of the likeness, expressing character and personality in the most pleasing way if it be well chosen and its disposition suggested by the individuality to be portrayed; that simplicity is the key to success in the pose, concentrating interest by the avoiding of complexity and the use of the twin principles of principality and subordination; that variety is essential for the preservation of interest, but must be introduced skilfully and with fine discrimination, bringing in distraction and confusion unless controlled and kept in place by continuity and unity, leading its attraction to the place of principal interest in the picture; and that the figure must always be supported and convey the sense of stability.

Convention: Freedom

The reader who will apply these principles in his work, choosing that form which seems best adapted to the true delineation of the most attractive view of his subject,

will quickly realize that the principles are vastly more important than the forms. These latter are, in fact, but the foundation or skeleton of the composition upon which the principles are applied to secure characterization and grace of line and mass throughout the composition as a whole. This being perceived, the worker possessing taste and feeling, or the cultivated eye which instinctively recognizes beauty in form, will doubtless loosely adapt the conventional forms to the portrayal of his sitters by means of the decorative line so commonly used today. This method, popular with the modern painters, seems to have originated with the Japanese, and consists essentially in suggesting rather than giving a plain exposition of beauty in line and form. But for the demands of everyday portraiture the more familiar and conventionalized forms are safer and more generally calculated to accomplish the end in view, i. e. the expression of the personality of the sitter. Let us see how these ideas are applied in actual practice.

Heads

For many reasons, but chiefly because character or personality is most largely expressed in the face, the "bust portrait," which shows only the head and a small portion of the torso of the sitter, is the most popular form of composition in portraiture. Many photographers labor under the delusion that this sort of portrait demands less skill than one showing the full figure. But this is true only in so far as the pose of the head and shoulders involves less complexity than the composition of the figure. As a matter of fact the clever pose of the one really demands as much skill as the other. First, the head must sit naturally upon the shoulders as part of the body. This is secured by giving the subject a support (chair), which accommodates itself to the body. The height of the chair-seat and the back of the chair should be such that the subject is perfectly at ease, so that the head does not sink into the neck or *vice versa*. The relation between the height of the camera and the head has a considerable influence upon the line and aspect of the latter. To get correct drawing, the lens should be on a level with the mouth or chin. This may necessitate raising the sitter by means of a platform, which,

however, is more a matter of perspective than of pose. As a rule, the less the photographer manipulates the head of the subject the better, as any attempt to place it in this or that position will inevitably result in constraint and stiffness. If the subject is comfortably seated, the head will itself assume its natural and characteristic pose. Sometimes, the subject, as a matter of habit, carries the head inclined to one side. This, of course, requires correction, but if this can be done by suggestion instead of actual manipulation so much the better. At other times, a slight adjustment of the head is necessary to correct a crooked mouth or eyebrows which are displeasing or very uneven in line.

A Common Fault

The most common fault in posing the head, however, is the straining after opposition between the head and the body. Now it is true that a pleasing sense of balance is sometimes obtained by giving the head a different direction from that indicated in the figure, but the rule is not invariable, and where the effect is secured at the expense of ease it is to be avoided. Especially should care be taken to avoid twisting the head so far around that it is brought nearer the camera than it would be in its natural position. This gives an appearance as though the neck had been broken, and is awkward in the extreme. Another fault is that of placing the head too high, so that the face is inclined upward. When this is done, and the sitter is asked to look at something at the normal level of the eye, when sitting, the confusion between the direction of the eyes and that of the head produces a most disagreeable impression.

It should never be forgotten that the two sides of the face are not alike, and that one almost invariably gives a more pleasing or characteristic likeness than the other. This better side should have the photographer's first and chief attention, before anything is done in the way of composing or placing the head.

Whether the view of the face is to be profile, three-quarter, or full-face depends upon the amount of character expressed by this or that view; the securing of a pleasing arrangement in this detail is of less importance than likeness. The profile will often be the most dis-

tinctive, the three-quarter view the most expressive; while the front view of the face is seldom as agreeable as one turned slightly toward one side or the other. In "bust" portraits of women, the lines formed by the costume need special care, since here we usually have the contour of the neck and shoulders or a decorative neck drapery to contend with.

Large Heads

The modern practice of giving a large portion of the picture space up to the head and face, i.e. the making of large heads, has much in its favor. Coburn, Dührkoop, Hoppe, Lerski, and Goldensky are notable followers of this method of portraiture. I quote Sidney Allen:

"The German photographers, without deteriorating it with a specialty, always considered a large head without bust as one of the favorable forms of expression in portraiture. The English painter Watts composed most of his portraits in that fashion. And the Old Masters—well, most of them favored the simple bust portrait which gave due, and perhaps just the right amount of prominence to the face. To them accessories were always secondary. But neither did they make the face the solitary point of interest. They adopted the golden middle way. The recent development looks a trifle exaggerated, and yet there is an excuse for it.

"If we photograph a person with the main purpose of getting a likeness, an accurate delineation of the face is, after all, the most important thing. We may not always succeed in getting it, but that is a different matter. We at least strive for it and would like to get it. And size has much to do with a satisfactory result, in particular with amateurs who work with small plates. A large-sized head commands more attention; it tells its story plainly, and, no matter how broadly treated, will show the features in more perfect detail. There are better opportunities for clear drawing and modeling, and the carrying out of lighting schemes. And for that reason a large head is an excellent recorder of facial structure and expression. It is a trifle severe, as it dispenses with all unnecessary embellishment, but it is more powerful and convincing than the small-sized face.

"Every phase of pictorial expression is ruled by certain laws of composition. Also this style of portraiture must have its own peculiar methods of arrangement; the most important factors consisting of the shape of the head, the relation of its size to the rest of the picture, and the placing of it in the allotted area."

Everything depends on the placing of the head, profiles and three-quarter views being less useful in this method than the (almost) full front view of the face. Symmetrical and angular forms appear exaggerated when large in size in proportion to the picture space.

The Figure in the Portrait

Considering the importance of the figure as a means of characterization in portraiture, and the value of its lines and masses, in themselves or in relation to the background or surroundings of the figure within the picture space, as an aid in securing pictorial effect, one is continually surprised by the excessive preponderance of "heads" and the rarity of figure portraits in the output of the professional photographer. The amateur, less trammeled by convention and working closer to life, usually includes the figure in his portraits, unconsciously giving them, in this way, a value as human documents which the professional portrait, despite its more pretentious style and finish, fails to achieve.

This reluctance to utilize the figure is more noticeable in American than in European portraiture, and in portraits of men more than in portraits of women and children. Strangely enough, it is most strikingly apparent in the work of those generally spoken of as leaders in American portraiture, where one would naturally expect to find some appreciation of the possibilities of the figure. Whether this defect, for such it is, proceeds from a slavish following of convention, from poverty of imagination or lack of courage, or from a mistaken notion of the difficulties encountered in figure composition, I have not been able to discover, but it plainly calls for reformation and improvement.

A Point of Departure

Let me point this suggestion for the reader, who perchance, may feel the desire for a new point of departure in his portrait work. Cultivate your ability in figure composi-

tion. It will give distinction to your work and add money to your purse, The real world of everyday, in which we live, is not peopled by a monotonous collection of animated busts, as present-day portraitists would lead one to believe; but by men and women and children whose personalities are revealed, at every turn, by an ever-changing succession of occupation, attitude, pose, gesture and action. The supreme interest, to be sure, is in the face and its expression, But we do not see our friends or those about us as an unending procession of abnormally large faces, thrust toward us in aggressively bold lines and masses of light and dark; but rather as reasonable creatures, interestingly different in shape, proportion and physical habit, who unconsciously and naturally express their individuality by an infinite variety of details in dress and manner, in the position of the figure and its parts, and especially by the use of the hands, whether in action or repose.

It is this completeness of characterization, this summing up of the whole man or woman, which marks the successful portrait. Let us see how the figure will help in this characterization

Portraits of Men

Perhaps the most difficult feat in modern portraiture, with the camera, is the full- or three-quarter-length pose of a man. It would seem that there is nothing in all nature so stiffly rigid, so unyielding and so irresponsive as the average man between twenty and sixty years. In action he may at times assume interesting or even graceful attitudes, but when sitting for a portrait, or worse, standing for it, he puts on an awkwardness and constraint which generally prove fatal to any hope of securing naturalness or ease. But there are compensations. With men, more than with women, the attitude is the man, the manner and bearing are eloquent of character. If one can get the sitter at his ease and free from constraint, and seize a happy moment for the most pleasing arrangement or pose, whether standing or sitting, the result will generally be satisfactory. To secure this freedom from self-consciousness we must contrive to get the sitter to forget the actual purpose of the moment.

Avoid the Stereotyped Pose

The principal difficulty is to secure variety and naturalness without strain or awkwardness. This is, in part, due to the severity of the lines in masculine dress, and the self-consciousness rigidity of the average man when he faces a camera. These conditions being constant, the photographer easily falls into the employment, for all his portraits of men, of a few stereotyped poses which have been found to be acceptable. These stereotyped arrangements, which are well known, are the things most of all to be avoided, while at the same time, attempts at novel or forced arrangements should be shunned with equal aversion. Simplicity is the key to success. In portraits of men we want character and virility rather than novelty striking effects. If we have stength and ease we can dispense almost with grace. If grace can be combined with these, so much the better, but the dominating qualities expressed in the pose should be strength and action, as befits manhood.

The Virtue of Simplicity

If we look over a collection of portraits by modern painters, who necessarily give more study to the pose than the photographer has time for, we will find that in their portraits of men they rarely attempt anything beyond the simplest pose. Most often it is a seated three-quarter figure, with the hands suitably occupied, according to the profession followed by the sitter. Usually the pyramidical form of composition is adopted as most expressive of stability and symmetry; whatever grace the subject may possess is judiciously emphasized by convexity of outline, and long, flowing interior lines; the rest is accomplished by harmonious lighting and the obtaining of a characteristic expression to give likeness. Note, as to these things, the simplicity and naturalness of the arrangements seen in Plates I and XI.

Ease and Grace

We must seek, first, an easy attitude; second, a pleasing variety in its lines, and last but not least, a graceful disposition of the hands. The general contour of the figure should be characteristic; every man has his favorite poses, which he takes unconsciously when he feels "at home" in any place. Some of these lack grace, and the

endeavor should be directed to finding which of the natural attitudes of the man is most graceful. This can most easily be accomplished by engaging the subject in conversation on some topic of current interest, or by allowing him to move about the room at his leisure, when his manner and carriage may be observed. It is folly to at once place a man in this or that predetermined position and "arrange" him to suit your notion of how he should appear. This can result only in awkwardnessness. In many of the portraits we see of men it is obvious that the subject has been made to take an attitude altogether strange to him, and naturalness cannot be expected under such conditions.

Poise of the Body

Another very important point in the disposition of the figure is to see that the subject does not rest equally on both feet—something which is wholly incompatible with ease. Attention to this will not only secure ease, but also give a greater variety of line to the pose. In standing, the weight will generally be upon one foot only, and the hip thrown out and the shoulder on the same side lowered in consequence. A turn of the head will supply grace to the movement. Speaking generally, old men give a better line when seated, and an easy chair, with its ample flowing lines, gives to such subjects the graceful dignity which belongs to age. Younger men, especially those with slight figures, can rarely be made to look comfortable or graceful when seated, and, still speaking generally, such subjects are best handled on their feet.

The Hands

The placing and arrangement of the hands in portraits of men will demand all the skill of the portraitist. The first care, since they catch the light almost equally with the face, is to see that they do not appear exactly opposite to each other, or form any definite geometrical figure in relation to the face. When they are brought together care is needed to secure a pleasing outline, so that they shall not appear awkward in shape. Neither should the two hands be separately occupied, as this would draw more attention than they should otherwise have in a portrait and create confusion. Sometimes the hands are so placed that each one demands separate attention. This

is generally undesirable and often altogether destructive of pictorial effect. Give the hands something to do, or connect them directly with the figure, as we see them in Plate I, avoiding, however, the separation of the fingers as shown in No. 2. For a clever and pleasing disposition of the hands see Plate XI, No. 2, which convincingly demonstrates the practical advantages of giving the hands something to do.

Animation

The general lines of the pose of a man should, of course, suggest animation, but too much action should be avoided. Remember that angles suggest action, unrest, and motion; vertical lines, support; horizontal lines or long horizontal curves are expressive of dignity and repose. An excellent method of studying the disposition of the masculine figure is to use a lay figure of small size, with which many profitable experiments may be made which will result in greater skill in the general management of the exterior lines of the figure.

Figure Poses of Women

With women the three-quarter or full-figure pose is generally less difficult than with men, but, considering the abundance of opportunity, we do not see that profusion of figure-portraits of women which one would naturally expect. And much more rarely, indeed, do we see a pose which has not some obvious and easily avoided defect. Women have more natural grace than men, and less awkwardness of carriage; their draperies, too, offer a more pleasing variety of lines than is possible with masculine dress. Moreover, it is much easier to give a woman something to do which will supply motive and interest in a portrait, besides enabling one to secure grace of action or harmony in arrangement. Contrast, for example, the two portraits in Plate V, noting the larger interest, as far as personality is concerned, secured in No. 1, despite the more attractive arrangement of the figure in No. 2. The same point is illustrated in Plate VI, as compared with Plate XII.

Avoiding the Obvious

The most common fault in portraits of women is the too obvious pose. This is generally expressed in a nervous or conscious strain after attitude. The first element of

success, therefore, must be flexibility, the relaxation natural to the figure when it is unconsciously easy. Where this nervousness is observed, a good plan is to occupy the subject with some phase of action natural to a woman, as for instance, the arranging of flowers, the "picking up" of the skirt, the opening of a parasol, and the like. In this way, by seizing an opportune moment, one may secure animation and grace of line in the figure as well as naturalness of expression. The moment of arrested motion may also be used to secure an animated and characteristic pose, as when a woman turns to greet a friend entering her room, or inclines the figure to take up something from a table, to arrange a lock of hair at the side of the head, etc. In all these details wherein we have pleasure in daily life a portrait may be had which will possess an easier grace than any formal pose. The widespread popularity of dancing today, with the development of suppleness and grace of movement which inevitably attends this exercise, is resulting in a more general use of the moment of arrested motion in the posing of women in portraiture. We see this curiously illustrated in the figure compositions scattered throughout the journals devoted to women's fashions. Formerly these were forbiddingly rigid and formal in pose, but today there is always a suggestion of movement which lends greater attractiveness to the flowing lines of the figure and enhances its grace.

The Formal Pose

It will often happen, however, that a more or less formal pose is desirable to exhibit the figure or the costume. In such cases the pose depends upon the peculiar charm or beauty of these features.

It may be that accessories will be needed to help out the lines, but these must be used skilfully because of their influence upon the proportion of the figure. For instance, in a standing pose of a woman under the average height, a low-backed chair of slight width and with long lines will add height and grace. The softly outlined, flowing folds of a curtain behind the figure, barely more than suggested, will also give the desirable appearance of height, or the subject may be made to stand (if it is accomplished without loss of ease) upon a

very low footstool or a movable platform, such as is used in photographing children, which will elevate the figure. This latter device is generally adopted where the costume has a train or is of unusual length. Formerly it was considered inadvisable to permit any space to show between the bottom edge of the costume and the floor in portraits of women. The fashions of today, however, have thrust this convention into the discard, since women's skirts are shortened and barely reach the top of the shoe, or where the top of the shoe would come if worn. This necessitates care in the disposition of the feet, which should not be placed too far apart, and should exhibit as much variety of line and form as can be secured. When the subject is attired in a severely cut, military costume with heavy lines in the lower portion of the skirt, it will often be advisable to use a graduated ground, providing sufficient depth of shadow at the base of the picture to soften the rigidity of the lines in the lower part of the portrait. The standing pose is undoubtedly the best with most women for showing the figure and costume to the best advantage. Stiffness, when it is apparent, may be obviated by giving the figure a slight turn from or toward the light.

The Profile of the Figure

The profile of the figure, with the head turned to the three-quarter view, as in Plate XII, generally gives a graceful pose; in handling a plump figure in this manner, however, vertical lines near to the subject should be avoided as accentuating the curves of the figure in a disagreeable way. If the subject shows a costume with unusual fulness at the shoulders or bust, it is well, where possible, to make use of the hat to give proportion to the head, which might otherwise appear insignificant. Similarly, where the hat gives the head undue proportion, the sitter should be persuaded to remove it, or the head be turned to give the hat as large a bulk as possible.

The principal lines of the pose should always be disposed so as to lead the eye around the figure, with the head as the chief point of interest. Abrupt angles, I need hardly say, should be guarded against, and the "line of grace" adopted for the general direction of the predominant lines through the figure. The forms of composi-

tion indicated, especially with the present mode, are the pyramid or the use of the decorative line. The pyramidal form is well illustrated in Plates V No. 2 and III No. 3. Where this form is employed, care must be exercised to see that the center of gravity falls within the figure, or it will appear to be unbalanced. The use of the decorative line is advantageous when the figure is in any other than an erect position; in its use a sense of balance is the essential thing to be secured after grace.

Things to be Avoided

In both standing and sitting poses, the carriage of the head has great influence upon the success or failure of the portrait, altering its outlines in a remarkable way, both as regards proportion and general effect. The lines formed by the dress, when the subject is seated, offer considerable difficulty in their harmonious arrangement, having a tendency to fall into triangles the apex of which is indicated by the knees. This difficulty may be obviated to some extent by selecting a chair of the right height for the particular subject—*i.e.*, one which is neither too high nor too low, so that the knees are not elevated. The sitter should also be seated well forward, so that the legs are bent at an acute rather than a right angle; in this way the folds of the skirt will fall more freely. The practice of drawing the dress tightly about the lower part of the body, showing the form of the hips and figure, cannot be too harshly condemned. In like manner, a standing pose is often seen in which the hands are joined over the lower part of the abdomen, this latter catching the light and so being made the more prominent because it is framed by the arms. A similar fault is that of seating a woman in *décolleté* dress too low, or inclining the body too far forward, so that the shoulders and bust are displayed in a way bordering upon vulgarity. There is much to be said in favor of the general use of a raised platform for all portraiture where the figure is seated.

The Hands

The most troublesome feature of the figure-pose, however, is the disposition of the hands, about which women are sensitive to a degree. In consequence of this we find in the portraits of women made, say ten to fifteen years

ago, that the hands are most often conspicuous by their absence. Sometimes they are placed behind the back, or hidden under the pages of a book, or fan, or among a few flowers; at other times they are hidden by folds of the skirt, or by a cape. When shown, the general complaint is that they are too large, a notion which has some foundation in truth, resulting from the common use of lenses of too short focal length which exaggerates the size of near objects, but also in some measure the result of the invariable practice among painters to represent the hands smaller than they are in life. There are various ways of meeting the difficulty, the best of which is to make oneself thoroughly familiar with the hand, how it expresses character, its varieties of arrangement and most graceful positions. In drawing on truth of form and proportion, very much depends upon the focal length of the lens and the distance of the hands from the point or plane of the principal focus. If two photographs of a hand are made, the one with an eight-inch (focal length) and the other with an eighteen-inch lens, the difference in result will explain the influence of the lens in a startling way. That the hands increase in apparent size and awkwardness of proportion according to their nearness to the lens is a matter of common knowledge which does not receive the attention it deserves. Keep them in line with the face.

In the treatment of the hands, the first rule should be to avoid showing their full width, or, if they must be so placed, to see that they are so lighted or modeled by shadow that their apparent width is lessened. Sometimes one hand may be completely in half-shadow with advantage. Among the painters whose management of the hands deserves the study of the photographic portraiture, I may mention first Greuze, and after him the greater masters Van Dyck and Lawrence. When a head, for instance, is posed leaning upon one hand, the effect is much better if the hand be against the dark side of the face and thrown into shadow by the head; and when the hands are not placed close together, so as to make a group in themselves, it would, I think, always be better to subdue one of them somewhat by shadow.

The Hands in Relation to the Face

Speaking of the hands in relation to the face, Carine Cadby says: The hand that is there of its own accord often supports the face; but an old conservative idea that it will spoil the shape makes us so ready to say, "No, don't touch the face," and yet experience in portraiture teaches us that the less often we say "don't," the better; and if our sitters rest their faces against their hands naturally, we should be only too pleased, and do our best to photograph them just as they are. Of course, they must not look to be holding their chins on with their hands, nor making deep dents in their cheeks with a finger, but very often we are able to keep the main pose, and with very slight alteration, get it to photograph well.

It is true that the hand is often of great value in a portrait when it is away from the face, and thus able to form some distinct spot just where it is wanted; but very often the spot is not wanted, and the hand becomes merely an embarrassment, whereas, whatever the difficulties of rendering the face and hands together, there is not the one of managing two separate interests. This naturally makes the composition much easier, and does away with a good many pitfalls, and is for that reason, to be recommended to beginners. The hand and face. too, being on the same plane, do not encourage those grotesque tricks of perspective where a huge hand appears to belong to a tiny face.

We hear a great deal about the character of the hand; which is also given as a reason for insisting that a hand shall show in every portrait. Yet many hands we see portrayed do not show any character at all, and the poor hand has evidently to content itself with "coming in" well, which was, after all, all it could expect! However, when the hand is close to the face it will stand a much better chance of consideration, if only for the sake of the important face, and will have to be represented in its best and most characteristic light.

Those of us who have studied the subject of hands know how the position of a hand against a face will suggest a mood. To take an extreme case: what expresses more utter dejection than when both hands cover

the face? And although one does not set out in portraiture to represent extreme emotions, yet the hand is useful to suggest more normal attitudes of mind—such as a pleasant contemplativeness or a spontaneous conversationalness, if one may be allowed such an expression. Let the hands tell their own story.

Another very practical advantage of photographing the face resting on the hand is that it allows us to do indoor work with a long exposure. The support of the hand not only prevents any movement, but helps the expression to be easy and natural. Even the most hopelessly stiff and self-conscious sitter will become comparatively at ease if given a table whereon he can plant an elbow and rest his face on his hand. This is well said.

Suggestions as to Form

As we have in hands a repetition of the same form several times in the fingers, we must endeavor to vary them somewhat. When the fingers are extended straight out and held close together, the effect is stiff; and if they be kept straight and spread equally, the result is a sprawled, awkward look. When the hand is open, three fingers pose together better than two, and some of the fingers should be drawn up, but not all equally. A completely doubled-up hand is not good—it is too like a fist; but a pose in the position of holding a pen or pencil, as when writing or drawing, is one which looks well from many points of view. A very bad arrangement of the hand is when it is held flat and the fingers doubled up to the second joint; the squareness of the form and the impression of the ends of the fingers being cut off are very unpleasant. Again, the hand very much doubled up, but the index finger fully extended, is an arrangement which looks exceedingly awkward from several points of view. A graceful pose is to bring the thumb and second finger slightly together, with the remaining fingers slightly raised. In this position turn the hand in any way you choose, and you will find agreeable lines, which will need but little correction to appear pleasing. The wrists as well as the arms will play important rôles in the composition of lines; but their management can be mastered with very little observation.

When the sitter is a person of education or refinement

it will often be noticed that the hands naturally assume a graceful position. Where this is observed the natural arrangement should be accepted. It is always the most characteristic when unconcerned, and drawing the attention of the subject to the hands will almost invariably result in awkwardness.

Profile Portraits

Recalling how often in everyday life we remark the happy combination of likeness and grace of pose seen in a profile view of a friend, or one with whose personality we are familiar, it is passing strange how rarely the profile is employed in portraiture. Ninety-nine persons out of a hundred live and die without any notion of their appearance when seen in profile. This, at least, gives the use of the profile the attraction of a new departure in the portrait. Apart from which, observation tells us that a profile view will often give force and pleasing grace in the expression of personality. This is not to say that the profile can be used without discrimination, but simply that it should never be overlooked in the search for that pose which will show the sitter at his or her best in the finished portrait.

Discrimination —the Key

So powerful for good or evil is the profile that the key to its successful use is found in that word, discrimination. It demands a good carriage of the figure, with natural grace in the proportions of the figure itself and, both in men and women, a pleasing outline so far as dress is concerned. Naturally the profile view is more generally adaptable for portraits of women, the lines of a woman's figure and dress lending attractiveness to the pose. Speaking generally, a suggestion of action is desirable, which may be suggested in a standing figure by a slight forward inclination of the body, with a turn of the head and shoulders, or by giving the hands something to do, such as holding a fan or muff.

The Head

Of paramount importance, says John Everard, is the way in which the head of the model is posed. A tilt too far back, or too far forward, a lean too much to the left or right, can make all the difference to the final result of the picture. Nothing is more ugly than to see the head thrust

forward or held back in an unnatural manner; the neck of the model—especially if in evening dress or draped—may be exaggerated in an astonishing manner.

It is well, therefore, to be very careful as to the way in which the model's head is placed. The direction in which the eyes of the model are turned is another point which should receive careful consideration — turned in too much of a downward direction, the model appears to be sleeping; while if the eyes are turned too high a strained effect is almost always infused into the picture. Frequently the lips of the model appear to be glued together, and in such a position are quite unnatural, finally robbing the study of much of its "truth," for the lips are supposed to contain a deal of character. A request to the sitter to moisten them with the tongue will restore them to their natural state.

So far the pose of the head has alone been discussed, but the direction in which the body of the model should be turned is almost of equal importance. On this point also it is possible to go very much astray. The golden rule in profile portraiture is: Turn the body of the model in the direction the eyes are turned. When, however, the contour of the face seen in profile is not wholly pleasing, disregard this golden rule and turn the head.

Observe closely this point in a profile you deem successful, and you will see the force of this assertion. The lines of the shoulders and arms should combine naturally with those of the neck and head, which may or may not be the case if the body of the model is placed squarely with the camera. Should the composition include the hands of the model, arrange them in a manner which does not attract attention from the face, always *the* point of interest in a portrait. Place a book, or fan, or flower in the hands of the model, or anything which will lend itself to the motive of the composition, but do not fold them or tie them together unless they are in some way connected with the body or face.

A last point connected with the profile pose: When focusing the image on the ground-glass screen, see that more space is left on that side of the picture toward which the face is turned, and by all possible means avoid placing the head in the center of the screen.

The Background As to the tone of the ground, it should be certainly not lighter than the middle tones on the face of the model. A ground too light in tone is detrimental to all the high-lights on the face; too dark, the high-lights are accentuated in an unpleasant manner. Figured grounds are not desirable in studies of heads; though clouded they often provide a fine setting for a portrait, as may be seen in Plate VII No. 2.

In these two profile portraits, the influence of the background in tone, as well as in design or lack of design, is plainly observable. Note, also, how the slight difference in the poise of the head conveys a different impression in each portrait. As to the tone of the ground, see Plate II Nos. 2 and 3. With a full figure posed in profile, as in Plate III No. 3, a plain ground relieved by varying gradations of light and dark gives a soft outline to the profile and helps the balance of composition wonderfully.

Children If ever one could be persuaded to agree with those who say that posing the figure in portraiture is unjustifiable, and generally does more harm than good, it would be in the portraiture of children. But here, as with grown-ups, the idea is fallacious, and we will find the principles and forms of composition as necessary as they are advantageous. It is true that the chief charm of childhood is its unconscious freedom from "pose," its natural dignity and unreserved naiveté. And, left to themselves, children will fall into or take most delightful poses or arrangements, which no artificial method could achieve. It is true, also, that any attempt to pose the average child or to handle such subjects in any way almost invariably brings self consciousness and an awkward rigidity which is fatal to good portraiture. Nevertheless, the photographer should use all his knowledge of composition in line and space arrangement, and all his skill in suggestion, to secure a portrait which will give the likeness *and* pictorial effect. Naturalness and simplicity are the chief virtues. Suppleness and flexibility, animation and responsiveness, are other things needing attention. The portrait of a child in which the body or poise

of the head is stiff and rigid, or in which we have expressionless repose, is a failure. For children under fourteen years, a standing pose will generally give greater grace of line and mass than one where the child is seated. Accessories with pronounced lines or design should be eliminated; simple grounds of light tone or furniture with simple and graceful lines will usually help to bring out the personality of the subject better than ornate and heavy accessories. When the subject is portrayed in a sitting pose, the seat should be low and properly adapted so that the feet of the sitter either touch the ground or are not too far from the floor. A good example of such a pose is seen in Plate VIII, which, to my mind, is as happy a combination of the principles and forms of figure composition as one could desire.

Portrait Groups

The methods employed in securing portrait groups are so fully dealt with in *Group Photography:* THE PHOTO-MINIATURE No. 129, that there is no excuse for attempting to explain them in the limited space left to me in these pages. But a word or two concerning two and three figure groups may be useful to those whose ambitions do not cover the making of larger compositions in this class of portraiture.

Two and Three Figures

The principal point of difficulty, in composing a group of two or three persons, is to give each figure its proper emphasis without violating the principles of principality and subordination. One must be subordinate, of course; or, to put it plainly, there must be a point of chief interest in the group as in every other composition. In a group of mother and child this interest centers in the child, and the pose of the mother should be so managed as to lead the eye to the child, the figure of the mother being subordinated to this end. In a group of two children, or even of three, the figures may be interwoven, as it were, this being well illustrated in Plate XI No. 1. With older children and grown-ups, the figures, though separated in fact, should be united or connected, as seen in Plate XI No. 2 and, less happily, in Plate X.

When the lower parts of the figures present difficulty,

the seating of the figures at a table will obviate the difficulty. In such pictures the form of the composition may be pyramidal, or we may simply seek a well-balanced arrangement and variety of line in the position of the heads or in the figures. Beware of confusion of interest, or too much complexity. The figures should not be too close together, nor the combination too large for the space it occupies, or the effect will be unpleasant. Sometimes the horizontal form suggests itself, as in a group of three children of which the half figures only are shown; in such a case the figures can be made to overlap each other, especially with children, but great care is needed here to secure a graceful outline of the heads. Speaking generally, a convex outline is preferable in all groups as giving solidarity, boldness, and grace; this line need not depend upon the figures but may be secured by draperies or accessories which, however, are not to be used unless directly helpful. Angles, and especially right angles, and parallel lines of heads are to be avoided, since they disturb the eye and prevent it from uniting the various parts of the group, which is essential to its unity. The heads are always the chief points of interest, and their relative position is the most important factor in the success of the group. They should not be so placed as to form any regular or geometrical pattern, nor placed directly above each other. Very little differences of position are important here, and will give pleasing variety. The lines connecting the figures composing a group should be as simple and as graceful as possible; thus a harsh, horizontal line between two figures will give the appearance of separation rather than of unity. Repetition of the same line or curve will sometimes be useful to convey a sense of unity obtainable in no other way. Converging lines should be avoided unless there is some point of special interest at their convergence, as they will naturally concentrate interest there.

The End

With this our discussion of the art of posing the figure in portraiture must be drawn to an end. If, from what has been brought out, the reader has gained some little insight into the supreme interest of the portrait, and has

learned how this supreme interest of likeness may be accentuated and made attractive by the pose, our adventure together will have been well worth while. We have considered, however, only the A B C of figure composition, and what has been gained in these pages must be supplemented by continual observation of the figure as we see it in everyday life. It is not by rule and law that the artist secures a pleasing or noble or faithful characterization in his portraiture, but rather by an intimate appreciation of the significance of personality, as expressed in the figure and face of his subject. The expression of personality in this way is kaleidoscopic in its variety, and only when the artist can bring a cultivated instinct to the recognition and appreciation of what is best in this kaleidoscopic variety, will the rules and principles of pictorial composition aid him in his interpretation of the personality of his subjects.

BOOKS

Pictorial Composition and The Critical Judgment of Pictures: By Henry R. Poore, A. N. A. 282 pp.; 83 illus. Cloth $2.

The A, B, C of Artistic Photography. By A. J. Anderson. 343 pp.; illus. Cloth $2.50.

The Photo-Miniature: No. 109: Drapery and Accessories. By Sadakichi Hartmann, Illus. Paper 25 cents.

[Also No. 64: *Figure Composition:* By Henry R. Poore, and No. 95: *Essentials in Portraiture:* By Sadakichi Hartmann, in this Series. These are out of print with the publishers, but may still be obtained by search among the dealers.]

The International Photographic Exposition

The general interest shown in the forthcoming International Photographic Exposition, to be held at the Grand Central Palace, New York, March 27 to April 3, has grown to such proportions that it is evident that the Exposition will be the most interesting event of its kind ever held in this country.

The Exposition will include displays of apparatus and materials from the principal manufacturers of this country and Europe, practically covering every department and application of photography in the arts, sciences and industries of today. The educational value of a comprehensive exhibit of this sort cannot be adequately expressed in words. To see, in one place, all the different kinds of apparatus used in photography, the thousand and one varieties of cameras and lenses, the different kinds of exposure shutters, color screens, exposure devices, studio conveniences and what not, with demonstrations of their uses and advantages, and practical expositions of the working of the processes of photography, is something which we have never before enjoyed in this country. From present indications it is plain that American photographers, both amateur and professional, are keenly interested in the affair, and thousands are already making plans to visit New York and the Exposition during the week beginning March 27.

At the annual meeting of the New York section of the Photographic Dealers' Association of America, under whose auspices the Exposition is to be held, it was announced that the several committees having in charge the local arrangements have practically completed their work, and the reports indicated a far better support on the part of manufacturers, exhibitors and the public than had been anticipated.

The entertainment committee reported that its plans included a general sight-seeing trip of New York for all of the delegates and their families, and a banquet to be held on Thursday or Friday of convention week.

To stimulate the interest of amateur, professional, scientific and commercial photographers, the exposition management has planned to devote as much space as is necessary to a display of photographs covering the several branches of the art. The prints will be hung under the supervision of men who have had experience in the arrangement of photographic exhibitions and will be properly catalogued.

A committee composed of five prominent photographers will pass upon the merits of the pictures, and to the successful exhibitors in each class, plaques will be awarded.

As it will not be possible to display all of the pictures which will be offered to the exposition, a definite closing date will be announced within the next thirty days. Therefore, those who desire to obtain space upon the walls, for which there will be no charge other than transportation of the pictures, are urged, to send for entry blanks without delay. Blanks and a copy of the rules and regulations will be forwarded upon request to Mr. F. W. Payne, Grand Central Palace, New York.

CHARACTER OF THE EXHIBITS

While one general scheme of decoration will be adhered to in the exposition, sufficient latitude has been granted the manufacturers to warrant them in taking extraordinary steps in the preparation of their exhibits.

It is estimated by the exposition management that fully 150,000 people will attend the exposition. This attendance, of course, will not be wholly a paid attendance as the exposition committee will apportion 300,000 complimentary tickets to be distributed through the various exhibitors and the members of the Dealers' Association.

Among the interesting displays will be a complete, though small, anastigmat lens factory; a plant showing camera-making in detail; a developing and printing unit

of the most modern character; historical exhibits showing the progress of the art from its practical beginning and a number of interesting working demonstrations of the various intricate processes which go to make up a popular photographic exposition. Much attention will be paid to home motion picture practice, projection machines and the allied lines and the delegates and the public as well will be shown many of the newest film productions through the means of the best modern machines.

Although conditions abroad have militated somewhat against the showing promised by the foreign manufacturers, many European firms have instructed their American representatives to secure space and it is expected that most of the prominent French, German and English manufacturers will be enabled to send material for display.

Everyone interested in photography in any of its phases, wherever he or she may be located, within a thousand miles of New York, should arrange to see this wonderful Exposition and take part in its activities. All inquiries should be addressed to the International Exposition of Photographic Arts & Industries, Grand Central Palace, New York.

Notes and Comment

In response to the widespread desire for information about enlarging, or making large prints from small negatives, The Bausch & Lomb Optical Co., 634 St. Paul St., Rochester, N. Y., has issued a special leaflet entitled "Enlarging with Condensers." The leaflet gives practical instructions on setting up an enlarging apparatus, the adjustment of the light and condensers, and the lens to use for various kinds of enlarging. It also gives new information concerning improved mountings for the condensers used by photographic enlargers, and is well worth sending for. Those who desire a copy may obtain it by addressing the Bausch & Lomb Optical Co., as above.

THE CRAMER MEMORIAL. The Committee in charge of the G. Cramer Memorial Fund, referred to in our last issue, report a nation-wide response to the appeal to professional photographers to pledge the taking of one day's business (May 20th) to the Fund. This is in accordance with the splendid spirit characteristic of American photographers, and in keeping with their appreciation of Gustav Cramer's life-long devotion to the interests of the craft. To remind those who have not yet sent in their pledges to the Treasurer of the Fund, we repeat the Pledge:

E. B. CORE, Treasurer,
76 Landscape Avenue, Yonkers, N. Y.

I agree to send, at the close of business on May 20, 1915, a check equal to the gross amount of orders received in my establishment during that day, as my contribution to the Gustav Cramer Memorial fund.

Date——— Signed————

A sum of at least $10,000 will be required for the proposed endowment. Those desiring any further information about the fund, whether amateur or professional photographers, may address Mr. Ryland Phillips, Chairman of the Executive Committee, 1507 Walnut Street, Philadelphia.

The new Seed Graflex plate, recently put out by the Eastman Kodak Company, and obtainable from most dealers, is said to be the fastest plate at present available, and to represent several years of patient and thorough research. Press photographers and hand-camera workers will doubtless welcome this new help for difficult subjects and dark days. According to workers who have used many different brands of plates, the new plate is said to be faster than any plate made abroad, and lacking several minor troubles found in the use of imported fast plates.

SISTERS
Elias Goldensky

FRANK GITTELSON

JOSEPH H. CHOATE
W. M. Hollinger

EDWARD SHELDON
Pirie MacDonald
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Lighting the Subject in Portraiture

The old-time standards in photographic portraiture, by which the excellence of the portrait was measured, were posing, lighting, and chemical or technical effect. In following these standards, photographers fell so deeply into the rut of method that the professional portrait stiffened into the product of a formula, with as little individuality as a visiting-card. In fact, as some of us remember, the earliest form of the portrait was styled a carte-de-visite, and, until a few years ago, it seemed as if it could not rise higher than its beginning. The sitter, regardless of his or her personality, was placed in certain generally accepted and approved positions, surrounded by furniture, accessories, and backgrounds conventionalized in design and use; the lighting, controlled by skylights and curtains, themselves regulated by stereotyped forms, was adjusted by well-known and standardized methods to give a pre-determined effect; exposure and development were in turn regulated by set and rigid formulas to give clear-cut, brilliant negatives, from which unexceptional prints were obtained, by printers whose chief aim it was to get as many hundreds of prints per day as the daylight permitted. Fidelity of likeness to the subject and individuality on the part of the photographer were alike forgotten. In their place we had either an attractive idealization by elaborate com-

position, or an uncompromising, map-like precision in detail, according to the ideals of the photographer. The only difference between the work of the master portraitist and that sent out by the low-priced "gallery" was seen in the cleverness of the pose, the skill of the lighting, the technical quality—and the price of the finished product.

Transition The coming of the amateur into portraiture as a means of livelihood, and a widespread movement on the part of the professional to study art principles in portraiture under the guidance of art museum directors and painter-critics, changed all that. The amateur, free from convention and tradition, attempted portraiture wherever he found his subject, measuring his success by the single standard of fidelity of likeness. When he began to add quality to his portraits, it was pictorial quality he sought rather than technical perfection. Meanwhile the professional, in his struggle away from the commonplace, was absorbing notions of "tonal quality," suppression and diffusion of detail, "atmosphere," schemes of light and dark and composition by spots, from the works of masters in painting, ancient and modern. And so, gradually but surely, the point of view in portraiture has been changing. Today we are in a transitional stage and the end cannot be foreseen, except that it will be complete freedom from method and convention, even to the total disappearance of the familiar "studio" and its trappings, save for strictly commercial work.

Today's Ideals Of the old-time standards, the posing of the figure alone has gained in appreciation and importance, but considered, with the lighting of the subject, as part of the portrait and not as something separate and apart. Technical or chemical effect, on the other hand, is largely disregarded in favor of after-work, either on the negative by means of the air-brush and similar devices, or in the choice and manipulation of printing papers and methods allowing a large measure of control over the finished result.

It is in the lighting of the subject in modern por-

traiture, then, that we see the transition from old to new ideals, from slavery to freedom, at its best and at its worst. Here, as every exhibition of portraiture shows, the professional is, as yet, working on unfamiliar and uncertain ground, groping for something which he has hardly learned to recognize and appreciate.

The New Viewpoint

As illustration of this: Some weeks ago I received a package of portraits from a photographer whose business card told me that he was a specialist in home portraiture. The letter accompanying the prints recalled the fact that, some two or three years ago, I had advised him to abandon his unprofitable studio, forget all that he had learned in it except the ability to make a good negative, and to take up home portraiture—making portraits of people in their own homes, just as he found them in everyday life. The writer of the letter went on to say: "It has taken me all this time to change my viewpoint, to get away from the artificialities of the studio, and to see people as they are naturally, amid the familiar surroundings in which they live. But it has proved worth while."

Learning to See

There's the point. To begin with the cultivation of the eye, to train the observation to see people as they live and move in the light of everyday life, instead of under the forced conventions of the old-time studio. Not by chance, but with malice aforethought, did Burnet begin his classic "Essays on Art" with a chapter on *The Cultivation of the Eye.*

How MacDonald Works

The working out of the transition in a practical way is illustrated in the methods followed by two or three professional portraitists of national reputation: Pirie MacDonald, W. M. Hollinger, and Elias Goldensky. MacDonald, himself a man of strong personality, alert and vigorous in his imagination, with a forceful way of doing things, abandoned his general practice and the follies of professional pot-hunting years ago, and restricted himself to the portraiture of men. His single aim is to get into his portrait the very spirit and personality of the man before him. Rarely

attempting the figure, and confining himself to the bust portrait, wherein the head of the subject occupies the greater portion of the picture space, the lighting becomes of supreme importance in his method. Here he boldly diverges from traditional studio ideas. His studio is an ordinary, large room in a business building, the windows curtained to exclude daylight, with a Cooper Hewitt light equipment suspended from the wall as the source of illumination used in all his work —a light source always uniform in value and efficiency, completely controlled by the photographer. As part of his technical training, MacDonald knows his light system as the painter knows his palette, what it will give him, and how to get the precise effect of light and shade desired at any point within the light area occupied by the subject. But it is not this which has given MacDonald his success in portraiture. That has come from the persistent cultivation of his mental and physical vision, his ability to recognize the lighting which reveals and emphasizes the personality of the man before him. This visualization of the subject is a matter of psychology rather than of photographic training; the use of the lighting system to secure the record of the visualization is purely a technical method.

Hollinger's Methods

Turn now for contrast to the method followed with so much success by Hollinger. Here we have a wholly different scheme, but based on essentially identical ideas. The Hollinger studio is a big, skylight room of the orthodox type used by painters. Two ordinary house windows replace the usual sidelight, and the skylight is built within a well thrust upward from the center of the flat ceiling of the room. There are no curtains, reflectors, shades or backgrounds, only a movable platform and a chair or two. For sittings, daylight is used by preference, but an electric arc lamp is available for use when daylight fails. Hollinger, being a devotee of the simple life, has apparently no strenuous notions of forcing the personality of his sitters. "Make them comfortable and let them be themselves" is his whole philosophy in the matter. But he has the seeing eye, cultivated by years of observation to a keen appre-

ciation of normal, natural lightings of the human face, as seen in the streets, parks, or in the home. His method, if method it be, is to seat his subject comfortably where his light source gives the lighting suited to the character or individuality of the person, and then to move his camera around until he gets the desired view of the face.

Note re. Reflectors

The abolition of reflectors is a noteworthy feature of Hollinger's practice, which has direct relation to the lighting of the subject. In his opinion the use of the reflector is destructive of naturalness in lighting, gives false values, and tends to artificiality of effect. In its place he employs translucent muslin screens, held in the hand at varying distances between the subject and the light source. By this means he has complete control of the light effects, gaining plasticity and force, with a truer gradation in the planes of the modeling than can be had with a reflector. For the same end, MacDonald uses a variety of queerly shaped hand-screens of open-meshed black muslin. Others have found these hand-screens, covered with light yellow muslin, useful for controlling the force of the sidelight falling upon a white dress, or to diffuse and subdue an over-forceful top light not otherwise controllable.

Goldensky's Viewpoint

Goldensky, by nature and art largely temperamental, masterful in his technique and radical in ideas, uses light without method or formula save that which seems to him, at the moment, likely to express his conception of the subject's individuality. In this he is as free in viewpoint as the veriest amateur, and as likely to attempt the impossible, but with this difference, that his lightings never fail to interest one in his subjects. By which token his portraits vary as infinitely in their expression of the individuality of his subjects as do the subjects themselves from moment to moment. This, as I have said, always stimulates interest, but may, at times, be embarrassing, as presenting an unfamiliar view of one with whom we thought ourselves familiar. In his professional work, therefore, Goldensky wisely curbs his fancy, bending his rare skill in lighting to

secure, first of all, a faithful likeness, and a composition which presents the subject at his or her best. Here, too, the light scheme, for Goldensky uses both daylight and artificial light at will, is but a matter of technical detail. The controlling factor is the mental vision by which he adapts his technical skill to the portrayal of the personality of the subject.

The Point of Departure

This ability to recognize the dominant note of personality comes by a patient, persistent study of faces, as we see them under the ever-changing lightings in everyday life. It is the lack of this ability which accounts for the sameness and monotony of the portraits turned out by the average professional studio. Wherever you find a portraitist whose work stands out by its human quality, as, for example the work of Strauss, Garo, Coburn, Hoppé, Falk, Furley Lewis, and Dührkoop, you find also this appreciation of personality which comes from continual observation. Here we have the point of departure in modern portraiture. The human face is infinitely varied by subtle and delicate irregularities of form and surface, projections and recesses, curves and lines, without an inch of perfectly flat area. It is in these minute and exquisitely modeled differences of form and structure that the individuality and character of the subject are expressed. With every turn of the head, and every slightest variation of the light falling on the face, there is a change of expression, every expression giving a different view of the personality of the subject.

Primary and Secondary Lighting

In lighting the subject in portraiture, the direction of the light falling on the subject is first determined by the general form and character of the head and features, after which the particular lighting best adapted to give the most pleasing or characteristic view of the sitter depends on the choice of the view-point from which we see the subject under the general scheme of illumination first determined. In other words, the right lighting is not merely that suited to this or that type of face, but that which gives us the most favorable view of the personality of the subject.

Thus, although the primary illumination is of vital importance, it is the secondary lighting, or after-handling of the primary illumination, which determines the quality of the portrait, whether regarded from the viewpoint of likeness or pictorial value! For example: the direction or general play of light on the subject may be well chosen and faultless for the type of face in view, but the lack of control in the after lighting, or the choice of the wrong point of view, may disguise or obliterate personality and give us a false rendering of the subject. So, also, the lack of ability to control the disposition of the light falling on the subject may result in the loss of the delicate differences of form structure which express individuality, and so give a portrait lacking in likeness. Thus, oftentimes, looking at the portrait of a friend, in itself technically faultless, we exclaim: "How utterly unlike him," and, contrariwise, seeing a crude hand-camera picture of the same friend we say: "How like him, a good portrait." The difference is generally in the particular play of light and shade on the face, rather than in the general direction of the illumination. The skill of the master portraitist is based on his familiar knowledge of these changes wrought by light and shade, and his ability to adjust their relation to the particular subject so as to express personality. This is, of course, the psychological side of portraiture, rather than a technical method; but its importance is such that, unless the reader can learn to base his technical methods upon it, his work will never rise above the level of commonplace.

Principles

The principles of lighting in portraiture are few and simple. It is in the application of these principles to the individual subject that the difficulties arise, and the skill required to solve these difficulties comes by observation and the cultivation of the seeing eye, rather than from book learning or the imitation of the mannerisms of other portraitists. There is a right lighting for every face, by which I mean a lighting properly suited to give a normal and correctly balanced illumination to this or that type of face, corresponding to the usual

lighting under which we see people in everyday life and from our estimate of their personalities. When once this lighting is secured, by placing the subject in such a relation to the light source available as will produce the general effect indicated as correct for the individual sitter, then every variation of that typical lighting will be right, although it will, of course, give a different view of the sitter's personality. Among these variations, some will be more favorable than others, wherein the photographer has his choice, according to his conception of his subject. In short, the principles of lighting may be summarized: arrange the general scheme of the illumination of the subject, by adjusting the direction of the light and its intensity, so as to secure a normal lighting of the type of face and head, and then choose the point of view which offers the most pleasing presentation of the personality of the sitter. As a prominent portraitist once put it to me in a few words: "There, the light is right. Make yourself comfortable while I change my (camera) position as I may need for what I want. I can portray only what I see in you—my view of you, nothing more."

Practice

One of the simplest ways of getting a clear understanding of the normal or correct lighting of the average face is that suggested by Raymer some years ago. This is to make a chalk mark x at the center of the studio floor, on a line running across the room from the rear end of the sidelight or window to the opposite wall. Then from the center x, describe a chalk-lined circle extending at the sides, to the sidelight and the opposite wall. Mark the line from x to the sidelight (1). Now draw a chalk line at right angles to this, from x to the near edge of the semi-circle including the sidelight and mark this line (5). Divide this quarter-circle by a line drawn from x midway between (1) and (5), marking this line (3), and divide these sections by lines drawn from x midway between (1) and (3) and (3) and (5), marking these lines (2) and (4) respectively. This will give a chalk diagram resembling a quarter-section of a cartwheel, with the sidelight occupying a portion of the right-hand side of the quarter-section, parallel with line

x5. Repeat this diagram in the left-hand quarter-section of the circle extending from line (5) to the cross line from x to the wall, directly opposite (1) at the sidelight, and we are ready for a few experiments in lighting.

Presuming the room to be about sixteen feet wide, with a sidelight eight feet wide, beginning about two feet from the floor and extending up to a height of ten feet, adjust the sidelight by opaque shades so as to get a light area say six feet square and nine feet from the floor at the top of the area.

Adjusting Light and Subject

Place the patient model comfortably at x, facing the sidelight, and place the camera on line (3), halfway between the model and the edge of the circle. Turn the face of the model from the sidelight toward the camera until the ear on the shadow side of the face is just barely visible, with a wedge-shaped catch-light at the upper right-hand corner of the iris in each eye. This will give a normal, three-quarter view of the face, a typical view generally considered to be that best adapted for a majority of subjects.

The Right Lighting

If the lighting is correctly balanced for the model's face, the roundness of the head and retirement of the planes will be well preserved, with a vigorous but pleasing relief in the features of the face. The brightest light will be on the forehead, cheek-bone and nose, from whence it should graduate to the shadow side of the face and chin. The brow will receive light in accordance with its projection, and under it will be perceived a shadow strongest between the eye and the nose. The light will again glance on the cheek-bone, graduating up to the hollow under the eye, and down to form the oval of the cheek. A light will run down the line of the nose, glance upon the point of the upper and the fullness of the lower lip, and faintly touch the prominent part of the chin.

Handling the Shadows

On the shadow side of the face, the shadow of the nose will be clearly separated from that of the cheek-bone, and the shadow of the tip of the nose will run at a slight angle to the corner of the mouth. If it impinges

on the lips, the light comes from too high an angle; if it runs across the cheek, the light is too low.

If the lighted side of the face contrasts too forcibly with the shadow side, a diffusing screen of thin muslin must be placed between the model and the light source, to diffuse and broaden the light effects. The test here, as to the actual position of the diffuser, is that we must always be able to see the flesh color of the face in the highest light and the deepest shadow on the face.

When the lighting has been so adjusted in relation to the subject, and its intensity so controlled that the lights and shadows on the face are clearly separated, and modulated so as to run into each other with correct graduation as the planes of the face recede, then we have secured the right lighting for that subject.

Varying the Viewpoint

If now, with the direction of the lighting and position of the model unchanged we move the camera to lines (1), (2), (4) and (5), the lighting will in every case be right so far as modeling and balance of light and shade are concerned, but a different view of the personality of the subject will result in each position. This difference will, of course, depend on the distance between the camera and the sidelight.

Repeating with Variations

The series of five negatives obtained in this way will give the reader as useful an introduction to the whole field of lighting in portraiture as could be desired, beginning, as it does, with the necessity of getting the right lighting for the subject, and then showing the variation of light effects in five positions from profile to full frontal views of the face. By repeating the experiment, with the same model, but letting the figure face along line X3 and turning the face toward the point (5) on the circle, an entirely different series of lightings will be obtained. A third series, with the model placed as in the second series, may be obtained by placing the camera on lines (5), (6), (7), (8) and (9), in which positions a dark background will be needed since the subject will, in several of the positions, be photographed against the sidelight.

The Best View of the Subject

The choice of the viewpoint which, among many possible positions, gives the most pleasing, or most characteristic impression of the sitter, depends wholly on the photographer's ability to seize the essential note in the personality of the sitter, and cannot be taught. Goldensky gives his notion of this as follows: Study the values of the highest lights as compared with the deepest shadows. Don't forget or overlook the different planes of the face, as they give you perspective. Suppress what is uninteresting, emphasize what pleases or interests you in the subject. Individuality in lighting as far as concerns the photographer, or as far as it bears on bringing out the personality of the sitter, is the result of training oneself to memorize facts and forms accumulated by observation, and the ability to register these subtle differences by adjusting the light on the subject so as to get those desirable effects which appeal to the cultivated taste. This is well put.

In this choice of view, it should not be forgotten that every subject presents a more pleasing impression when viewed from one side of the face than when seen from the other. In other words, it is common experience that every face has its "best side," which should be looked for before the general scheme of illumination is determined. The selection of the wrong side of the face will oftentimes result in the failure of the portrait, since the latter, no matter how pleasing or artistic; presents a less favorable impression than could have been secured with the same lighting applied to the other or "best side" of the face. As observation will show the difference is plainly noticeable even in unfamiliar faces where we can compare portraits made from the two viewpoints.

Avoiding the Rut of Method

Working along the lines suggested and always starting from a normal, correct lighting for each type of face, it is obvious that no special instruction will be needed for the handling of different styles of lighting, since this will be sufficiently indicated by the requirements of the subject. Freedom from convention and rigid formula is the natural result of this changed

viewpoint, and, the principle being perceived, any desirable variation is accomplished naturally, and without effort, according to the needs of the moment.

Normal Lighting

From the foregoing experimental lightings many lessons of vital importance may be learned. First and foremost, it will be apparent that the normal lighting of the head and face should give the idea that the light comes from a single source. Until the worker is very sure of himself, the simpler the scheme of lighting adopted, the more certainly will he secure pleasing effects. Begin with a systematic observance of the elementary fact that the head is a spherical body, and as its parts recede from the eye or from the source of illumination they apparently become darker in tone and merge in a series of shadows. If the lighting, whether in high or low key or scale, shows this natural merging or modulation of light into dark, from the highest lights on the projections of the face to the deepest shadows of those parts farthest from the light, this essential rotundity of the head is preserved and the natural relief of the features will be secured. In a correctly lighted bust portrait there will be a continuous modulation of light and shade, with never more than a mere point of absolute black shadow or unrelieved white space. When the light falling on the subject obliterates the delicate semi-tones, the photographer should be warned thereby to control the volume of light, by suppressing its general force or diffusing its direct impact by screening it, until the gradation of tones assumes its proper range.

Seeing Tone Gradation

A good plan by which to get a correct appreciation of this tone gradation over the face is to look at the subject with half-closed eyes for a few moments before viewing the ground-glass image, where color and reduction of area are liable to deceive the eye.

Influence of Direction of Light

Another valuable lesson gained from the experimental lightings will cover the influence of the angular direction of the light. This will naturally vary much with the different types of face dealt with. Gen-

erally speaking, the thinner and longer the face, the less abrupt or steep should be the angle of the direction of the light falling on the subject. Especially where the face has strongly marked projections of brow, nose, cheekbones, mouth and chin, or hollow cheeks, is it desirable to employ a low sidelight area, to lessen the force of the projections and throw light into the shadows. When we have to deal with a round, full or plump face, on the other hand, a low light angle should be avoided as adding unnecessary breadth to the face, where a steep light angle will give more pleasing proportion and relief to the features. With very long, thin faces, the front light will usually give the most effective rendering. If a three-quarter view of such a face is desired, see that the ear on the shadow side is seen sufficiently to fill in or balance any hollow apparent in the cheek at that side of the face. Similarly, in dealing with a subject having a round, full face and a short, plump neck, let the subject stand, even for a bust portrait, and let the light fall from above the head at an angle of 45°, choosing a three-quarter or profile view to secure elongation of the head and face.

Side Lighting

Until within the last few years, the 45° light angle was generally accepted as that best suited for the portrayal of the average subject. Latterly, however, photographers have gone to the masters in painting for guidance in this detail, and side lightings, with the light falling at 35° instead of 45°, have been widely employed. This light angle inclines to give a generally round effect to the face, so that it should be used with discrimination, because of its tendency to cause the shadows under the nose and chin to fall horizontally instead of slanting downward, thus giving breadth. The shape of the shadow masses is a detail which should always have careful attention when once the placing of the highlights has been determined. It will often be found that the difference between a caricature and a pleasing portrait is largely dependent on these shapes. They can be modified by a slight turn of the head, or by the use of the diffusing screen, where it is seen that they interfere with the characterization of the subject.

Size of Light Area

In all side lightings, regardless of the angle at which the light reaches the subject, the key or scale of tones in the portrait is controlled by the size of the light area and the distance of the subject from the light. Portraitists differ in their methods in this regard, and one cannot reconcile the arguments brought forward in behalf of this or that particular method. Some advocate a wide-open light or large light area and a diffusing screen of ample proportions between light and subject. This bathes the sitter in a broad illumination, giving the modeling of the face by a series of softly graded lights and halftones. It is especially useful in making portraits of children and of ladies in white draperies. But for portraits of men, I prefer the alternative method of using a restricted light area, concentrating the volume of light, and controlling this with a small, circular diffusing screen held in the hand during the exposure. This control effectually lightens the shadows on the farther or dark side of the face, while the smaller light area, with the subject fairly near to the light source, gives vigorous lights passing by quick gradations into half tone and shadow. A light area only four feet square, such as an ordinary house window beginning three feet from the floor, and the subject less than five feet from the window, is well adapted for lightings of this character. It is not so well adapted for portraits of women or elderly persons and is, of course, practically useless for figure portraits. For these last we need a high sidelight, screened perhaps with black muslin at its lower third if the subject wears a light-colored dress, so that the major strength of the light will come from slightly above the head of the subject, the latter being placed well into the room.

Flat Lighting

A method of lighting which gives pleasing effects when handled with discrimination, both in the choice of subject and in its application, is that known as "flat lighting." It is generally employed for heads and half-figures of women and children in light-colored dresses or draperies. In such subjects the face and bust are usually well rounded and supple, without unsightly

hollows or depressions, or strongly marked muscular forms. It gives a softly defined, plastic interpretation rather than the hard and uncompromising delineation favored by commercial portraitists, and is, therefore, largely favored by amateurs and professionals who seek pictorial effects rather than map-like precision and inclusiveness in their portraits.

The Method For this method, a high side window is more suitable than the ordinary studio top-and-side light, and the fact that such a window may be found in most homes probably accounts for the popularity of this method with the amateur. Any room twelve or fifteen feet square, with such a window, will offer adequate facilities for the method.

If the window comes down to the floor, screen the lower half with light-cream curtain material of open mesh. Where the only window available faces the sun, thus admitting strong sunlight during the sitting, the whole window may be screened with white or cream muslin, with advantage.

The subject seated on a low-backed, comfortable chair of the right height, is placed directly opposite the window, about six or seven feet away, and three or four feet away from (in front of) a white or cream-tinted background, stretched on a frame to give an even, uncreased ground.

The camera is placed directly in front of the window, about three feet away from it and a little to one side of the center of the window. Ordinarily, this obstruction of the light will give a slight shadow tone behind the neck and shoulders, or at one side of the head of the subject, with a slight relief around the contours of the face and neck, which gives just the most desirable degree of plasticity and modeling. The features will, of course, be broadly and softly lighted, with no decisive lights, and the hair, with any ornament worn about the neck, such as a jeweled chain, or folds of tulle or chiffon, aiding to set off the delicately graded flesh tones.

The depth of the shadow tones and degree of relief in the subject will vary according to the distance of

the subject from the background. By placing a dark screen well in front of the sitter and at right angles, the soft line of shade about the edges of the face can be strengthened or emphasized at will. This is especially desirable in the making of profile portraits.

Exposure Despite the light background and draperies of light tones, the exposure should be full, and rarely less than four seconds. Double-coated plates will make a wonderful difference in the results, as compared with ordinary plates, and development in diluted solutions, naturally prolonged, with the plate in darkness, is advised, to retain the scale of gradations, which is short.

Measuring Light Variations The variation required in exposure as the subject is placed at different distances from the light source is a question which sorely puzzles the amateur or professional working in the home. Here the light source available is, almost invariably, a side window, screened as to the lower part and representing, approximately a light area four feet square. Since the light entering the room through this opening may come direct from the clear sky without obstruction, or may be in part obstructed by nearby walls, houses or foliage, it is obviously impossible to get more than an approximately correct idea of the variation of the intensity of the light at different distances from the window except by the measurement of these variations.

A Simple Method A simple method, which will give the reader much helpful information, was suggested by Randall, in *Photography*, a few years ago. It is based on the fact that the intensity of the illumination given by the window of an ordinary room, or the skylight of a studio, does not vary or diminish according to the square of the distance, as the old rule expressed it, but more nearly directly as the distance, i.e., in proportion to the angular extension of the sky area seen through the window.

Using the Method To use this method, the reader should take his stand at a series of measured distances from the window to be used for actual portraiture, and make careful actinometer

tests of the light at these distances, by exposing the actinometer in the shadow of the body or head, and recording the "actinometer times" so secured. Any actinometer which employs sensitive paper giving a standard tint by exposure will serve for this purpose and, of course, the tests need be made only once for any given room or window.

Variations in Exposure

As these actinometer tests will show, the light entering a room or studio diminishes in arithmetical rather than in geometrical progression, and this progression gives us a series of exposure figures easily remembered for after use. For example: taking the light area as four feet square, the light intensities at 10, 7, 4 feet distant and right in front of the window may be expressed by the figures 7, 4, 2, 1. Thus, at the window, where the angular extension is 180°, the exposure being expressed by the figure 1, then at four feet distant (angular extension 90°) double the exposure will be required, expressed by the figure 2; at seven feet distant (angular extension 60°) four times the exposure will be needed, expressed by the figure 4; and at ten feet distant the exposure must be seven times that needed at the window, the angular extension here being 45°, and the exposure expressed by the figure 7. Proof of the practical accuracy of these differences in light intensity may be had by exposing pieces of print-out paper at the distances mentioned for five, ten, twenty and thirty-five minutes respectively, beginning the series at the window, when the darkening or tinting of the paper will be seen to be practically identical in all exposures.

As the size of the light area is increased, so the equality of the illumination is greater over a larger area. With a sidelight twelve feet square, for instance, the angle of 90° strikes the floor at twelve feet from the window, and the light would vary only as 1 to 2 within that area.

Profile Portraits

Despite the fact that comparatively few persons present a wholly favorable impression when seen in profile, and that a profile portrait is rarely satisfactory from the viewpoint of likeness, the desire for such a portrait is

voiced by perhaps ninety per cent of those who visit the average professional studio.

Their Interest Wherein lies the charm or interest of this style? It may be admitted that the profile view often lends itself to a more striking representation of the head and bust. It offers, in many instances, a more pleasing or more interesting line and space arrangement than the usual frontal view. Its irregularity of outline suggests variety, and the opposition of lines and spaces within the pyramidal form gives animation and life to the portrait, as contrasted with the stiffness and monotony of the frontal view. But, chiefly, I think the interest of the profile portrait lies in the fact that it awakens curiosity and sets the imagination in motion. Who ever saw the profile of a beautiful woman, or of a man of strong and interesting personality, without instantly desiring to see the other side of the face; to have the person turn around, in order to show the more satisfying, because more complete, view of the beauty or character which the profile half concealed?

A Defect In this we see why the profile portrait so quickly loses its interest. The more it compels our admiration or curiosity, so much the more does it disappoint, since it fails to satisfy the interest it awakens by its very lack of completeness.

Some Advantages Apart from this single, but marked defect, there can be no doubt but that, in many cases and for all sorts of reasons, the profile portrait flatters the average sitter. Which, without further explanation, sufficiently accounts for its popularity. Thus, where the features of the face are well rounded and inclined, perhaps, to be a trifle heavy, the profile view, with the head ever so slightly tilted upward, adds the grace of refinement. In the case of a man or woman of marked intellectuality or distinctive character, it will generally add force and dignity. Sometimes it will enhance the natural beauty of a face by its emphasis of the contour, and the setting provided by the dark masses of hair or decorative coiffure, or the graceful, curving lines of the neck and

bust. It is not suited to the long, thin face, or one in which the features have marked irregularity, or where the neck is badly proportioned. And it follows from this that, where the subject is not adapted for portrayal in this style, the profile view will result in caricature, which indicates the need for discrimination in its use.

Importance of Pose

When the profile view is seen to offer advantages, the greatest care is necessary in the posing or arrangement of the figure before the problem of lighting is approached. The chair or support used should be carefully chosen to give the right poise or support to the body, which should be held comfortably erect, always flexible and without stiffness. The neck should have perfect freedom and the head should be carefully balanced in the view chosen for presentation, without strain on the one hand, or the appearance of being sunken in the body on the other.

The effect of the lighting upon the ensemble of face, head and bust will depend very largely on this arrangement of the figure, hence the importance of giving care to this preliminary detail in the making of the portrait.

Lighting the Profile

As far as the lighting itself is concerned, profile portraits may be secured as readily in any ordinary room with a fairly high window as in the most elaborately designed photographic studio. The top or skylight of the latter is rarely used in this style of portraiture, and can always be dispensed with. All we need is to control the light source so that the main direction of the illumination comes from a point slightly higher than the head of the subject, for which the average house window offers ample facilities. For some subjects and to secure certain effects, the light may with advantage be directed from an opening or light area almost on a level with the eyes of the sitter. The variation needed can be determined only by experiment, depending on the subject or the effects desired in the portrait. The chief care is to avoid too heavy shadows under the projection of eyebrows, nose and chin, and to preserve a desirable transparency in the shadows of the face and head. This applies especially in portraits of women, where

softness and fine gradation of tones must be combined with brilliancy of illumination. In portraits of men, sharper contrasts of light and shade are permissible, as giving a bolder relief and modeling.

General Principle As a general principle, apart from what are known as "line" portraits, wherein a line of light boldly outlines the profile in strong contrast to a dark ground behind the face, the lighting for a profile portrait should envelop the whole of the head and bust with such a gradation of tone as will preserve the characteristic roundness of the head, while giving the desired emphasis to the profile of the face. This enveloping of the subject with light, and the subtlety of the tone values, will depend largely on the size of the light area used, and the position of the subject in relation to it.

Placing the Subject To make a beginning, let us suppose a room with a window six feet high and three feet wide, having opaque and white roller shades running from top and bottom. A dark ground should be placed at one end of the room. Place the sitter well back in the studio or room at the end of the light area, at least four feet away from the dark back-ground already mentioned, and well within the room, i.e. as far from the window as the height of the light area used. If this measures six feet from top to bottom, place the subject six feet away from it, within the room. This distance should give a pleasing roundness to the modeling of the head, without undue heaviness in the shadows, the light traveling softly across the illuminated side of the face from the brilliant outline of the brow and nose to the back of the head, which will imperceptibly merge into the dark ground. The subject here is supposed to be facing the far end of the light area, into the dark corner of the room, and is viewed from a point near the window, the camera being placed between the window and the subject. Whether the sitter presents a shoulder or a three-quarter-body view to the camera will depend upon the pose of the figure. There is less strain in the effect of the turn of the head required to get the profile view

in the former than in the latter, although it may be that the latter will offer a more pleasing line arrangement through the whole composition. The distance of the camera from the subject will be regulated by the desired size of the head within the picture space and the focal length of the lens used, but generally it should be about half-way between the subject and the window. By varying the position of the subject ever so slightly, and turning the head to or away from the light, always keeping the eye on the shadow side of the face out of view, the lighting effect may be changed to suit all the many different types of faces with which the photographer has to deal.

Variations of Effects

Following out the experiments here suggested, it will be found that whether the lighting simply outlines the profile, leaving all the rest in soft shadow, or whether the head and bust be illuminated in varying depths of tone, with the face in half tone, depends wholly on the position of the subject in relation to the light area, or upon changing the position of the camera, i.e., the viewpoint from which the portrait is made. The nearer the subject is to the light area, and the farther away from the end of this area, the more pronounced will be the light-and-dark scheme in the portrait. Conversely, the more the subject is brought into the room, i. e. away from the window, but kept within the light area, the softer and more diffused will be the illumination of the head and bust. Do not overlook the necessary variation of exposure required for the different positions. Allowing always for the proper illumination of the heavy shadows, the exposure will need to be increased as the subject is placed farther away from the light. Full exposure is the golden rule in profile portrait work, for obvious reasons.

A Profile in Halftone

To make a profile portrait with the face wholly in half tone and the light coming over a shoulder, softly illuminating the hair and back of the subject's head: bring the subject well forward into the light area, back to the window, so that the light comes from behind the figure. Place the camera half way between the sub-

ject and the window. Now turn the head of the subject until the face is seen in profile, with a clear separation of the shadow from the nose and that on the cheek, and give the plate a generous exposure to ensure softness. If the viewpoint be carefully chosen, this will give the bust lighted from above and behind the figure, the hair and back portion of the head and neck well rounded by soft gradations of light and shade, and the profile of the face in quiet relief against a dark ground. The lighting effect here mentioned is illustrated in the portrait which secured the third prize award in the Ansco Company's Loveliest Women competition, with which the reader is familiar.

"Line" Lighting

Another pleasing variation of profile lighting is that generally known as "line" or "Rembrandt" lighting. In this the subject is so placed that the profile is sharply outlined by a distinct line of light, the face being in half-tone and the head and bust in fairly deep shadow, which may, of course, be relieved by a decoration of hat, hair or neckwear which will catch the light. We have an example of this in the portrait by Philip Conklin, which secured the first prize award in the Ansco Loveliest Women competition.

This method of lighting calls for great discrimination in the choice of the subject, demanding an unusually good profile to begin with and a face in itself attractive to the eye. Without these it may easily result in caricature, because of the prominence it gives to the distinctive features of the sitter.

To make such a portrait, the light area should be smaller than that previously indicated, and fairly high in its relation to the head of the subject. The sitter is placed quite near to the window and the camera at about the center of the room or studio, so that the subject is viewed obliquely, the light tipping the outline of the face as it is seen against a dark ground, and the camera is placed parallel with the ground. Sometimes a low background, placed parallel with the window or light source, is used to get this lighting, the light falling upon the subject (seated low) from above the background. The masses of shadow which envelop the

face and bust of the subject, placed as indicated, will need careful handling, to retain their transparency with subdued detail and modulation. The lens should be shielded from direct light during the exposure, which will generally be three or four times that required for such profiles as we have previously considered.

The Figure in Profile

Given a subject wholly admirable for the purpose, with appropriate background or other setting, and the necessary skill in posing in the photographer, a profile full-figure portrait is one of the most delightful styles in portraiture. It is especially suited to the slender, plastic figure of a girl in her twenties, attired in a becoming dress of light colors and not too heavy material. If to this combination the lady adds the right sort of hat or summer bonnet with loosely flowering ribbons, or a parasol cleverly handled, then we have material for an unusually attractive figure-portrait in profile. Sometimes one can get such a portrait out-of-doors, in a garden where the subject is outlined against a dark hedge or distant shrubbery, with the low afternoon sun coming against or around the outline of the figure. Or it may be tried in a room or studio with a sidelight coming low down to the floor, and a white or light-gray ground which will relieve the outline of the figure attractively. The principles used in lighting such a portrait have already been suggested. Success depends upon the pose almost as much as on the lighting here, but the result will justify the effort.

Sunlit Portraits Outdoors

The reader who revels in a country home and its ample lawn or garden, will find all sorts of delightful possibilities in sunlight portraiture out-of-doors. Properly handled, sunlight will give indescribably charming effects, the vibrating quality of the light giving a touch of life and animation to the subject rarely obtainable in a portrait made indoors. This method of lighting is naturally best adapted to portraits of women on the sunny side of thirty, boys and girls in their later teens and children, always in light-colored outdoor costume, as they usually appear during the leisure hours of a summertime afternoon.

Apart from the subject, the time of day and the background are important details. Late afternoon, when the sun is low and casts long shadows, is the most suitable time. It is quite useless to attempt outdoor portraits with the sun high overhead. If the sun is so low that his rays fall too directly on the sitter's face, giving the subject distress, it will be well to interpose a muslin screen so as to shield the face of the sitter from the direct rays. This screen may be a circular affair, about thirty inches in diameter held in the hand, by the photographer, during exposure.

Location

The place for the sitting (which does not mean that standing figures are to be excluded) should be chosen so as to give the figure a fairly dark, subdued and indefinite background, of trees or shrubbery if possible in shade. A background which has any well-defined forms or spottiness is not suitable. If unavoidable, this spottiness should be reduced or removed in the negative by the use of a small wad of cotton on the end of a match, well wetted with alchohol, and used with a circular motion on the dry film of the negative.

In lighting the figure out-of-doors in sunlight, a side lighting is desirable, as outlining the figure in a pleasing way, so that it stands out in slight relief from the background, which serves as a foil to the lighter tones of the sitter's costume. Willow or wicker furniture is adapted for this sort of portraiture, and altogether preferable, if accessories are used, to ordinary indoor furniture.

Exposure

The exposure should be gauged for the figure, not for the darker background, which will be better if under-exposed. The aim in lighting and exposure is to secure gradation even in the highest lights, with softly lighted shadows. The harsh contrasts so often seen in sunlight portraiture should be avoided. They result, as a rule, from under-exposure and forced development. By giving a full exposure, using double-coated plates, ortho preferably, with a 2-times yellow screen, and a well-diluted developer, gradation can be retained, and the soft, but brilliantly lighted modeling which is most desirable in this method of lighting. For example:

using a double-coated ortho plate and 2-times screen (adjusted to the plate), with the lens at $f/6$, gives an exposure of two seconds.

Finis

With this our survey of the principles and methods of lighting the subject in portraiture must end. I have endeavored to emphasize the broad principles, rather than to give a series of methods for securing precise effects, as most likely to help the reader to attain practical ability in lighting. With these principles well in mind, the requirements of any subject and location will present little difficulty, and the variations possible will indicate themselves.

Notes and Comment

The Photographic Exhibit at the Panama-Pacific Exposition, San Francisco, is housed in the Palace of Liberal Arts, together with equipments and products of typography, geography, cosmography and topography, instruments of precision, philosophical apparatus, chemical and pharmacal arts, musical instruments, engineering, etc.

From an article furnished by Theodore Hardee, Chief of the Department, I gather that the photographic exhibits are limited to displays by the Eastman Kodak Company, Bausch & Lomb Optical Company, The Simplex Photo Products Company, Ansco Company, The Sprague-Hathaway Company, The Campbell Electric Company, and The Nicholas Power Company. Of the section devoted to pictorial photography I have no information, except that Mr. William Hartmann, of New York, has been appointed a member of the Jury of Awards to judge the exhibits in the photographic section, and is now in San Francisco on that mission.

A charmingly illustrated price-list is that just published by Voigtlander & Sohn, 242 East Ontario St., Chicago, describing the lenses, cameras, binoculars and opera-glasses offered by this well-known European house. The brochure opens with a remarkably clever Alpine photograph, given as an example of the work of the Voigtlander Collinear lens; this is followed by an instructive article on the selection of lenses, which offers much useful information. The different series of the Collinear, Heliar, Dynar and Euryscope lenses are fully detailed, the latter half of the list being devoted to special lenses for process and three-color

work, cinematography, projection, telephotography, etc. The Voigtlander Alpine and Bergheil Tourist cameras, and the Stereo-flectoscope are also listed in detail. Copies of the list may be had for the asking.

The first of the 1915 camera catalogues to reach me is the Ansco catalogue, a beautifully illustrated, sixty-four-page list, crowded with interesting information about the Ansco line of hand cameras and specialties for amateurs. This year the Ansco cameras are described in three classes, according to the lens equipment, viz.: the Symmetrical Class, the *f*/7.5 Anastigmat Class and the *f*/6.3 Anastigmat Class. Each class offers a choice among several exposure shutters, with varying speeds up to 1-100, 1-150 and 1-300 of a second, covering every range of work, including advanced speed photography.

A distinctive feature of the Ansco series is the exact radius finder, which automatically reverses the position of its plane to correspond with the focal plane of the Ansco, insuring that the shape and field of the picture, as seen in miniature in the finder, will be identical with the actual picture on the film or plate.

A new introduction is the Ansco Vest-Pocket No. 2, a focusing camera, fitted with an *f*/6.3 or *f*/7.5 anastigmat and Bionic shutter, with exposure up to 1-200 of a second. This dainty and efficient little instrument is equipped with a micrometer focusing device, consisting of a milled wheel and flange just back of the lens plate, which may be operated while locating the object in the finder, and permits of accurate focusing for distances of 100, 25, 15, 10, 8 and 6 feet. The camera is fitted with a hinged watch-cover lid to protect the lens, and has vertical and horizontal view finders. It retails at $25.

The Ansco novelty of the year, however, is the Ansco Filmpack, which has several features distinguishing it from all other filmpacks, viz.: the films are packed against each other, back to face, without any black paper between, which obviates any risk of absorbing moisture. The Ansco pack has but a single tab pro-

jecting from the camera at any time, which prevents the mistake so often made of drawing more than one tab at once and thus wasting an exposure. The unexposed films are stored in a central chamber, from which they are drawn as required to the front of the pack for exposure, and after exposure passed to a rear chamber, from which they may be removed at any time for development, either before or when the whole of the twelve exposures have been made.

The film in the Ansco pack, when in position for exposure, is backed by a rigid stationary septum which holds it flat in the focal plane, thus obviating any tendency to buckle or wrinkle. This is an obvious advantage with films larger than 3¼ x 4¼. There are many other interesting items in this Ansco list, and the wide-awake reader should get a copy from his dealer and give it a careful perusal.

An unusual bargain list is that issued by the Herbert & Huesgen Co., 311 Madison Avenue, New York, on the occasion of their removal to larger premises on 42nd Street. It contains perhaps 800 items: cameras of every sort, Balopticons, stereopticons, Radiopticons and Delineascopes, motion-picture apparatus and anastigmats and other lenses, all more or less shopworn or second-hand, and marked with the list prices and the special selling prices. I would warn the reader not to look into this list if he has any spare cash, or he will be tempted beyond his strength to resist.

The Pacific Union College, St. Helena, Calif., has a department of photography in charge of Mr. J. B. Anderson. The purpose of this department is to instruct its students in photography for use in their work as missionaries abroad, for the illustration of articles and lectures promoting their work.

The course covers forty minutes' darkroom work each day over ten months, with two hours each week in the field making negatives. Incidentally the students are taught practical negative-making in the

field, interior work, printing and enlarging, lantern-slide making by contact and reduction methods, with the elements of chemistry and optics.

A very remarkable lens bargain is offered by C. G. Willoughby, 810 Broadway, New York, to wit: Carl Zeiss Convertible Anastigmats, Series 4, absolutely new, at 40 to 50 per cent discount from list prices. This means that, unless the stock is sold out by this time, you can buy a Carl Zeiss Double Protar, *f*/6.3 for a 2¼ x 3¼ plate, at $19, and so on, up to an eleven-inch lens of the same speed, at $75.60.

Mr. Alfred J. Newton, at one time Principal of the London Polytechnic School of Photography, and latterly Manager of the Wratten & Wainwright Division of Kodak, Ltd., England, has just returned to London after a visit to this country extending over three or four months. During his visit Mr. Newton, who is well known as one of the foremost European experts in process and color reproduction, addressed various bodies of engravers and workers in the graphic arts in Chicago, New York and elsewhere, giving his impressions of American process houses and their equipment, as compared with European firms in the same line. I am glad to know that Mr. Newton will probably return to America and associate himself with the Eastman Kodak Company, at Rochester, in the near future. I found in him a man of delightful personality, vigorous in his opinions, versatile in his abilities, and evidencing a sound scientific training in photography and allied processes, hence his work in this country cannot but be beneficial in many ways to American photographers and process workers.

One of the most interesting exhibits at the recent International Photographic Exposition, New York, was that made by Mr. William Nesbit of Springfield, N. J. Mr. Nesbit is an electrical expert, who has

devoted himself for some time past to the invention and perfecting of apparatus for High Speed Flashlight Photography indoors and out-of-doors, for the photographing of animals, athletic sports and the like. His work must be seen to be properly appreciated, and I suggest that those who are interested in this class of photography should send a stamp to Mr. Nesbit with a request for the booklets which describe his apparatus and service.

I regret to learn of the death of H. Q. Sargent, President of the Sargent Photo Supply Company, of Cleveland, Ohio, at the age of seventy-six. Mr. Sargent was one of the oldest photographic dealers in the country, having started in business away back in 1870, the firm name of Sargent & Co. being a household word in the Middle West. Apart from his business interests, he took an active part in public affairs, and his departure will be regretted by thousands who knew and respected him.

The 1915 Kodak Catalogue, with an exceedingly attractive cover design, reaches my desk as these pages go to press. It is, as usual, irreproachable in typographical make-up and illustration. The foreword deals with "Autographic Photography," explaining the great convenience of the new Autographic Kodak Back, recently introduced, which permits one to write a title or other similar data upon the film after making the exposure. The convenience and value of this invention cannot be overestimated. It obviates all need of a notebook and ensures a permanent record, made part of the negative, which cannot be detached or lost.

This autographic feature has been applied to the Vest-Pocket Autographic Kodak, which is now obtainable equipped with either the Kodak Anastigmat *f*/7.7, at $10, or the Zeiss Kodak Anastigmat *f*/6.9, at $22.50. The Autographic Back can now be had separately for most of the different Kodak models, so

that there is no necessity to buy a new Kodak in order to avail oneself of this useful device.

Among the novelties, I note a series of Kodak Sky Filters, intended to equalize the great difference of light between the sky and the foreground in landscape photography. The Kodak Amateur Printer is another new introduction. It gives uniformly masked prints of any size from 1⅝ x 2½ to 4 x 5½ inches, using a 60-Watt Mazda lamp, at $5. Copies of the catalogue can be had from any Kodak dealer.

Rexo is a new gaslight or developing paper which is being widely introduced by Burke & James, Inc., Chicago and New York. It is made in three grades, adapted to all classes of negatives, and each grade is made in three surfaces, each grade and surface being obtainable in regular and double weight, so that Rexo may fairly be said to cover every requirement of the amateur and the professional photographer. Enlarging Rexo is an altogether different variety for daylight and artificial-light enlarging, with a speed thirty-five times faster than Rexo Normal. It is made in two grades and four surfaces, single and double weight. Careful tests of these Rexo papers, with widely differing negatives, have proved that they amply sustain the manufacturers' claims for them as possessing distinctive quality and unusual exposure latitude. The latter feature is bound to make Rexo popular with the amateur, who is often a poor judge in the exposure required for artificial-light printing.

By addressing Department 4042, Burke & James, Inc., Chicago, the interested reader can obtain a free sample package of Rexo paper, together with particulars of the local dealers from whom he can obtain regular supplies of the paper. The offer is one which should not be put aside.

I am advised by G. Gennert, New York, Chicago and San Francisco, that this firm has been appointed distributing agents for the New Record Plate, which

they can now supply to the trade at very liberal discounts.

The 1915 Gennert catalogue describes, amongst other seasonable introductions, a new Montauk camera, very similar to the well-known English Sanderson camera, for general exterior and interior work. The new Montauk has a turntable bed and double rack and pinion movement. It is equipped with the Tessar *f*/6.3 or Sylvar *f*/6.8, and has other special features which distinguish it from all other view cameras.

The Ensign Popular Reflex Camera also deserves mention. This camera is for plates or filmpacks 3¼ x 4¼, is exceedingly compact and light in weight, and is fitted with the Ensign self-capping focal plane shutter, all the speeds being set from one key. Equipped with the Ensign anastigmat working at *f*/4.5, this remarkable instrument retails at $57, which breaks the record in prices for cameras of this class.

An innovation in the "Movie" world is promised in the shape of pictures which can be shown in daylight in the open air. The light projecting these pictures comes from behind the screen, showing through, instead of over the heads of the beholders. It is said that there is a great saving in power effected by this change in the position of the projector. The screen used is specially prepared, and is white and translucent, not transparent, with minute corrugations giving a prism effect. Another notable feature of the new system of projection is that one can approach to within a foot of the screen at either side and yet see the pictures without the least distortion. The invention is the work of Albert Buechner of Zurich, and Antal Fodor of Paris, and is said to be the result of seven years' experimenting.

A very practical and very helpful manual on "Photographic Enlargements" has just been published, apparently for free distribution, by R. D. Gray, manufacturer of Parallax Reflectors, Ridgewood, N. J. The

little book is full of just the information which the enlarger needs, and the reader will do well to send a two-cent stamp to Mr. Gray asking for a copy, while it may be had.

The thirteenth annual exhibition of the Buffalo (N. Y.) Camera Club was held at the Club Rooms, April 17 to 27, and attracted a larger attendance than in any preceding year. In keeping with the reputation of this club for pictorial work of the more serious sort, the seventy-six prints shown abounded in good straight photographic, as well as pictorial quality. Among them were five bromoil prints (showing that this fascinating method is not wholly forgotten by American amateurs), twenty-four bromides, eleven platinum prints, one example of the kallitype process, and twenty-four carbon prints. The Honor Prints of the exhibition were chosen from the exhibits of Harlow H. Boyce, Edward I. McPhail, Hy. W. Schonewolf, F. J. Sipprell, Emil Strub, and C. E. Kelsey, with Honorable Mention to prints by Wallace Lumley and Sipprell and Kelsey already mentioned.

According to a note in the "British Journal," "There is every indication that tinted portraits are growing in public favor and demand. The style which is rapidly growing in favor is a delicate vignette, either head, three-quarter, or full length, in black platinum or mat bromide (why not any development paper of suitable surface?), lightly yet very delicately finished in water-color. There must be no attempt to hide the photographic basis or to give the similitude of a water-color drawing; the result must be frankly a black and white picture, with the color added in the same way that the old artists used to finish their pencil drawings with a wash of color. Body color is not allowable, and only a suggestion of color should be put upon the draperies or dress."

There is an excellent suggestion here for the best sort of a hobby or profitable specialty. Those who would

like to learn the tinting of a portrait according to the most approved methods of today should get THE PHOTO-MINIATURE No. 44: "Coloring Photographs," which gives a complete course of practical instruction in this specialty.

In spite of the rigid prohibition of photography at the seat of war, it is likely that we shall yet see moving pictures of actual scenes at the front. I read that Radclyffe Dugmore has just returned from Belgium, where he secured a number of thrilling cinematograph pictures of the German artillery firing. At Alost he was, I am told, in the advance of the Belgian forces during an attack by the German artillery, and a shell shattered the wall of a house less than six feet away from where Mr. Dugmore was working with his camera. This all sounds very like Dugmore. Here's wishing him a safe return—with the pictures.

A useful convenience, just introduced, is the Eastman Etching Knife, which is quite different in its design from any etching tool within my knowledge. The cutting edges have a curve, which obviates any tendency to dig into the negative with a sharp point, and yet are flat enough to give just the right cutting surface.

A competition offering $3,000 in cash prizes, for pictures illustrating Kodak advertising slogans, is announced by the Eastman Kodak Co., Rochester, N. Y. The five slogans to be illustrated are: Class 1, "Take a Kodak With You." Class 2, "All Outdoors Invites Your Kodak." Class 3, "There Are no Game Laws for Those Who Hunt With the Kodak." Class 4, "Let the Children Kodak." Class 5, "Write it on the Film—at the Time." (For Autographic Kodak advertisement) Class 6, For the best new slogan, submitted by competitor, together with a picture illustrating it.

The awards are as follows: For the best picture illustrating any one of the first five slogans, $500. For the

second-best picture illustrating any one of the first five slogans, $200. For the best slogan and illustration submitted in class 6, one award of $500.

This is, in many ways, the most interesting of the many competitions announced by the Eastman Kodak Co., and should stimulate universal interest among amateurs everywhere. We hope our readers will take the fullest advantage of its opportunities for fun, fame and fortune. See the special circular obtainable on request from the Eastman Kodak Co. for full details and terms of the competition.

Photographs for the Papers. How to Take and Place Them. By John Everard. 96 pages and 19 illustrations. Paper boards, 50 cents. New York: Tennant and Ward.

This is an interesting and concise guide to the field indicated by its title. While we do not consider it as meaty or as useful for the American worker as THE PHOTO-MINATURE Nos. 120 and 124, those who already have these numbers of the P.-M. will find Mr. Everard's little volume well worth its cost, as describing what press photography means in England.

Everyone who has attempted to write or print a title or make a decoration with water-color white on a photograph or mount knows all that can be told of the difficulties experienced in finding a water-color white which will do the work satisfactorily. Either the color will not run easily and uniformly from the pen or brush, or it dries too rapidly, or it fails to make an even stroke, or the deposit is not continuous or uniform in color, or the "white" refuses to "take" altogether on the print or mount. The designer of show cards or advertising signs, using water-color white, is equally familiar with this peculiar difficulty. For which reason I gladly announce the fact that at last, we have a perfect water-color white available for all such purposes in "Snow-White," introduced by its inventor, J. W. Johnston, P. O. Box 578. Rochester, N. Y. Having

said that this is a perfect product, speaking from a full acquaintance with the requirements, and the way Mr. Johnston's invention fulfils these requirements, nothing more need be said here. But the reader who has use for such a product—for titling all kinds of photographs, mounts, albums, etc.—should write to Mr. Johnston and get the little book about "Snow White" for his further information. By sending 25 cents in stamps, a trial jar of "Snow White" can be obtained, and this is the most practical way of testing its convenience and many uses. Mention this note.

I have many inquiries concerning the construction of skylights and studio lights of various kinds. These inquiries come from professional portraitists making changes in their studios, and, in increasing number, from enthusiastic amateurs desiring to put a skylight into their homes for portrait work. No handbook on this interesting topic is at present available, The Photo-Miniature No. 50, Studio Construction, being out of print. Readers who desire information on this subject are referred to F. M. Bowers & Son, 925 West Washington St., Indianapolis, Ind. This is a thoroughly reliable firm, supplying skylights of every description at reasonable charges, and willing to give correspondents any special information desired as to their specialties.

The Photographic Journal of America is not a newcomer in the photographic magazine field, but our old and valued friend and adviser, *Wilson's Photographic Magazine* in a new series, new dress and under a new title, at $1.50 per year instead of $3. The change is made to bring "Wilson's" into line with the intention of its editor, Mr. Thomas Coke Watkins, to publish a photographic journal of the widest possible appeal, for amateurs of the better sort as well as for professionals. I cannot say too much in favor of this beautiful and interesting journal in its changed and improved form. How it can be produced at the price is a question Mr.

Watkins must answer, but the earnest worker in photography can help him give the right answer, and help himself considerably, by subscribing to the P. J. of A. on the spot. [122 East 25th Street, New York.]

That clever pocketbook, "Useful Tables for Photographers," published for free distribution by the Bausch & Lomb Optical Co., Rochester, N. Y., has been reissued in a revised edition. It will help you to better pictures, and you can get it for the mere asking.

The 1915 Graflex catalogue is just out, with an attractive cover as usual, and the good news that the prices of the Auto Graflex Cameras have been materially reduced. The 1A and 3A models now have the Autographic feature without any advance in price. I note four new models: the Compact Graflex, 3¼ x 5½; the Telescopic Revolving Back Graflex for 3¼ x 4¼ pictures; the Revolving Back Graflex Junior, for pictures 2¼ x 3¼; and the Graflex Enlarging Camera for enlargements up to 8 x 10. The Graflex Roll Holder is another 1915 novelty which will be welcomed. It is unusually compact and takes the new Graflex Speed Film, interchanging with the plate holders supplied with the camera. It has a device for drawing the film taut. Copies of the catalogue can be had from the Folmer & Schwing Division, Rochester, N. Y.

The International Exposition of Photographic Arts and Industries, held at the Grand Central Palace, New York, at the end of March, is now so far past that I can give it only a few words here. Briefly, it was a splendid success in attendance, interest and exhibits, the most interesting demonstration of the pleasures and possibilities of photography I have seen in my fairly wide experience of expositions here and abroad. Over sixty-seven thousand persons attended the Exposition, despite a blizzard, which made travel difficult during the last few days. The exhibits comprised thousands

of photographic specialties in the way of apparatus, materials and processes, sent by the principal manufacturers and importers of photographic goods. The exhibition of photographs sent in for the competitions announced by the management, as well as those shown by the various trade exhibitors, formed a collection of possibly two thousand prints, abounding in interest and quality. I am glad to know that the Exposition is to become an annual feature, next year's show being scheduled to be held at Cleveland, Ohio, in connection with the 1916 Dealers' Convention in that city. Those to whose work and pains the success of the 1915 Exposition was due, especially Mr. Goodhart of the National Dealers' Association, Mr. Huesgen of the New York Dealers' Association, and Mr. Payne, manager of the Exposition Company, deserve the warmest praise and recognition for their efforts. The most readable account of the affair is that published in the May *Photo Era*, which may be had from most dealers for fifteen cents, and the official report of the Dealers' Convention is published in the May and June issues of *The Photographic News*, of New York (42 East 23rd St., New York, 10 cents per copy.)

A few days ago I had the pleasure of a visit from Mr. Charles J. Miller, managing director of Gevaert, Ltd., London, who is spending a holiday here during the enforced lull in the business of his firm in Europe. The Gevaert concern is one of the largest photographic firms in Europe, employing over a thousand workpeople at its main factory at Antwerp, with branch houses at Paris, Vienna, Berlin, St. Petersburg (Petrograd) and Buenos Aires. Its list of products comprises a long line of printing papers, films for photographic and cinematographic use, and dry plates.

The Gustav Cramer Memorial

The progress made in securing pledges from photographers for the establishment of the Gustav Cramer Memorial up to date is best seen in the accompanying letter and list from Mr. Pirie MacDonald, of New York:

"Mr. John A. Tennant,
103 Park Ave., New York.

Dear Tennant: Answering your inquiry as to how the Cramer Memorial is getting on, it can be done in no better way than by referring you to the subjoined list of people who have already sent in written pledges to the effect that they will give a sum equal to the amount of the orders for photographs received in their studios on Papa Cramer's birthday, May 20th, 1915.

It is queer how neglectful people sometimes are of matters in which they are avowedly interested. I know a dozen of the bigger men who have said that they were going to be with us in this matter, but who have thus far neglected to send in their written pledges —just sheer carelessness, but Phillips is writing to them, I believe—and they will only need to be reminded.

Don't you think that we have done wonderfully well so far? Cordially yours,

Pirie MacDonald."

THE LIST OF PHOTOGRAPHERS WHO HAVE SENT PLEDGES

Ryland Phillips, Philadelphia; Pirie MacDonald, New York; C. H. Wiebmer, St. Paul; A. F. Hamley, Maquokita, Iowa; Frederick Pohle, Buffalo; H. B. DuBois, Live Oak, Fla.; Belle Johnson, Monroe City, Mo.; Harris & Ewing, Washington; Will R. Murphy, Newton, Kansas; Frank Medlar, Spencer, Iowa;

Arthur L. Macbeth, Baltimore, Md.; Carl K. Frey, Utica, N. Y.; Manley W. Tyree, Raleigh, N. C.; Miss Reinecke, Kansas City, Mo.; Miss Sara Kuhn, Boston, Mass.; McCullom's Studio, Columbus, Ohio; A. R. John, Paris, Ky.; F. E. Abbott, Little Falls, N. Y.; F. E. Post, Denver, Colo.; W. H. Rau, Philadelphia; M. J. Bowler, Conway, N. H.; E. Q. Thayer, Noblesville; Emmett Miller, Chappaqua, N. Y.; Aveldson Studio, Jerome, Ariz.; Luke Power, Rochester, N. Y.; F. A. W. Dean, Alliance, Ohio; Geo. D. Smith, Oak Harbor, Ohio; Flecher & Maury, Lynchburg, Va.; Lucia Weeks, Mansfield, Ohio; Lewis E. Imes, Lansing, Mich.; Biddle & Porter, London, Ohio; E. M. Martin, Logan, Ohio; Cochrane Studio, Charleston, W. Va.; F. E. Mock, Rochester, N. Y.; C. A. Anderson, Witbee, Wis.; Deimel Studio, Eureka, Cal.; Victor George, Chicago, Ill.; R. Gebel, St. Charles, Mo.; H. M. Anschutz, Keokuk, Ia.; Geo. A. Wonfor, Camden, N. J.; Ernst F. Miller, Cole Camp, Mo.; C. Tondorf, Milwuakee, Wis.; T. Henry Black, Jamestown, N. Y.; Hubner Studio, Milwaukee, Wis.; Exley Studio, New Bern, N. C.; Strauss-Peyton, Kansas City, Mo.; Harvey, Boise, Idaho; Mary Sunderlin, Flemington, N. J.; Bieresdorfer, Vincennes, Ind.; Durst Bros., Deer Park, Washington; A. N. Hopland, Clarkfield, Minn.; O. H. Henderson, Quincy, Washington; Mrs. Otto Turk, Jamestown, N. D.; F. C. Lutes, Fort Scott, Kansas; Tobias Studio, Lancaster, Ohio.; Nathan S. Warner, Plainfield, N. J.; E. H. Harwood, Appleton, Wis.; S. Trad, Parker, S. D.; Grabill Studio, Fayetteville, Ark.; E. J. Poisson, Biddeford, Me.; Miss Rene Leavitt, Chalco, Neb.; Ed. Rosch, St. Louis, Mo.; Otto Spieth, Jacksonville, Fla.; Mrs. E. A. Bowler, Wyandotte, Mich.; and many others.

This is a splendid showing, but many more pledges are needed. Send your pledge today without fail, or your check for any definite sum you desire to contribute as your share in the Memorial. Address: E. B. Core, Treasurer, 76 Landscape Ave., Yonkers, N. Y.

FESTIVAL HALL, PANAMA-PACIFIC EXPOSITION, SAN FRANCISCO, 1915

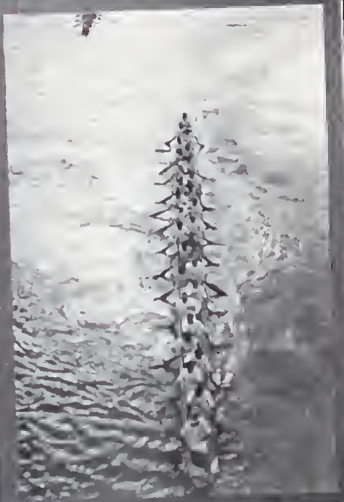
AN AUSTRALIAN GIRL'S PETS

ON THE SKIPPER'S ROAD, NEW ZEALAND
Wide-angle lens, $f/22$. One second
Walter Burke, F.R.P.S.

Contents of a home being moved up river in a dug-out canoe

Maori women hurdle racing in canoes
1-100 second, f/8

Ship on the Pacific, taken from a passing steamer



A race in Maori war canoes
f/8, 1-100 second

LOOKING OUT FROM AN ICE-CAVE IN THE MUELLER GLACIER

The ice ranged in color from a clear white through all the blues, to a deep purple. Exposure ½ second, $f/22$, Wratten KII screen

Walter Burke, F.R.P.S.

AN EXPLORER'S GRAVE, NEW ZEALAND

I spent the best part of a day finding this grave, clearing away the growth about it, and making the picture. A yellow screen was used to equalize the color values of the grass in the foreground and the Alpine peak against a blue sky.

Walter Burke, F.R.P.S.

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume XII JUNE, 1915 Number 138

Travel and the Camera

Close to the joy of seeing strange places and new sights lies the joy of making pictures of them. In this is the lure of the camera, the secret of its universal appeal and popularity. The pleasure one has when, turning a corner in an Old-World city, we suddenly stand before the richly sculptured front of a medieval cathedral, or get our first glimpse of the all too quickly passing glories of a world exposition; the thrill of delight which comes as we sit among ten thousand in one of our open-air theaters, watching a two-thousand-year-old Greek play, or away up on the "bleachers" following a big baseball game, is multiplied a hundredfold if we bring back with us pictures of what then delighted the eye and fired the imagination. Which is to say that he who travels away from home should take his camera with him, and so make sure that the distractions of the after days shall not rob him of any one of the thousand pleasures of his trip abroad. And when we speak of tourist photography or travel and the camera, let us not think, as we are too apt to think, that this means the use of the camera somewhere overseas or in far-away places. In truth, travel and tour cover every sort of journeying away from home, whether it be a summer trip to the American or Canadian Rockies, or among the Swiss Alps, the hills of New Hampshire, along the Maine coast, over the ocean or across a continent. And by the same token, the week-end trip up the Hudson, and on by rail and lake to Montreal and

the St. Lawrence, or along the quiet reaches of the upper Thames or through the Trossachs, or down the Florida coast, gives just as many opportunities for travel photography as the longer trip to Norway or Japan, Burma or the Fiji Islands, or the volcanic mountains of New Zealand.

The Field of Away-from-Home

This is the big field of away-from-home with which we are concerned in these pages. My purpose is to get together, in one place, as much information as is available for the helping of all who take the camera with them on their trips abroad. It is, of course, all too big a field to cover in detail; for making pictures in one place is very different from making pictures in another. Here one needs this sort of information, and there quite other information. Broad generalities are useless. To say: "Let your exposures be generous" may be all very well for the man who goes up into the hills; but the man who spends his holiday along the seacoast will not be helped by that same advice. I will therefore, make my suggestions as definite as is possible, with the single purpose of helping the reader to get, say, ten good pictures out of every dozen exposures.

For the larger portion of what follows I am indebted to Mr. Walter Burke, the Editor of the "Australasian Photo Review," who has had a very considerable experience away from home with the camera in Australasia and Europe. As matter of fact, Mr. Burke drew from his experience and sent me a complete monograph on Tourist Photography, intended for this number of THE PHOTO-MINIATURE. But the Great War has so disturbed travel conditions, as affecting European trips, that his monograph obviously needed modification and change to make it useful now and here to American and European readers. Hence I have thought it best to widen the scope of the monograph by supplementing it here and there to make it fit the requirements of here and now.

Two Sorts of Travelers

Most of those who take a camera along when going away from home are "snapshotters" pure and simple. They see something of which they would like to have a

record, point the camera at it, snap, and trust to luck for the result. To such photography is but an incident of the trip. If the results are not good, or the percentage of failures runs high, why bother about it? There was fun in the doing. But there are others who are just serious enough to want results, and who will be disappointed if the pictures made during their travels do not turn out well. For these this little book is made. "Whatever is worth doing at all is worth doing well," as the First Primer told us all years ago. It is just as simple to make good photographs as to make failures. And there is as much, or more, pleasure in the result as in the making of the picture. All the difference lies in taking thought aforetime. To revert to the First Primer: in photographing away from home, an ounce of foresight is worth a ton of hindsight. It is necessary to know one's tools, the camera and what it will do, to know something about the making of good negatives under widely varying conditions, the handling of different sorts of subjects, and what to do with the negatives when we come to the making of prints and enlargements on the return home. These few essentials must be covered at home before the trip begins. A color screen or a lens shade may make all the difference between success and failure, satisfaction and wasted time and expense. They take up no extra space in the equipment if we think of them before packing; but they may be ungettable just when and where we need them if we do not think and provide beforehand. If the reader cares at all about success along these lines, this little book will undoubtedly give him friendly and valuable help and suggestion.

Apparatus for the Trip

Despite the plain facts that no one thinks of reading a photographic book until he has already bought his camera and outfit; and that the average man, setting out on a holiday with the camera away from home, will naturally take with him the camera he has, or, at all events, will rarely, if ever, purchase a photographic equipment adapted for his journey according to the book; it is still necessary to say something about apparatus before we take up the discussion of subjects and their handling.

Plates vs. Films

One of the biggest factors in any journeying away from home is the carrying of things—summed up in the big word impedimenta. So we come squarely up against the familiar but never-settled problem of plates *vs.* films! Personally, I would settle the question, once and for all, as far as travel photography is concerned, by saying films, first, last, and all the time. But opinions differ, and many workers still insist on using plates. Without doubt, plates have many virtues, and I cheerfully admit that for years nothing could persuade me to use films. But year by year films have improved in quality and convenience, and today, without a doubt, they have quality, speed and orthochromatic or color-rendering capacity sufficient to give the traveler all he desires in the way of good technical work. This verdict I have reached after using thousands of film-spools in all parts of the world and years of laborious carrying of plates in bulk.

Plates

It is true, again and again, that the wonderfully crisp and technically perfect picture of this or that, with all its delicate rendering of color and atmosphere and planes, which we see reproduced here or there, is generally found to have been made on a double-coated ortho plate, with a carefully tested color screen, and two seconds' exposure with the camera on a tripod. But the great majority of travel pictures are made, and must be made if made at all, by simple hand-camera exposures, after quickly "finding" the subject and getting it to fall happily within the confines of the picture space. We might argue the question, pro and con, for a month, and get no farther. If the camera is meant to take pictures larger than 2¼ x 3¼ in., then to carry plates sufficient for a day's exposures is to take one's pleasures sadly. To carry a stock of some particular brand of plate sufficient for an entire trip involves considerable risk, not to mention bulk and weight, and yet it is not always easy to get fresh plates of any one brand, or of an odd size, in any and every locality. And bulk and weight and bother are the very things we seek to avoid when traveling away from home.

Films On the other hand, films are light in weight, make little bulk, are extremely convenient to mail or carry, and can generally be obtained in a large variety of sizes in any part of the world, whether it be a small town in Idaho or in Paris, Sidney, or Tokio, or in the Highlands of Scotland.

In two important details, viz: the reproduction of "color values" and lack of halation, the film of today is vastly superior to the ordinary plate. These qualities are especially helpful in outdoor work, where we have to deal, on the one hand, with excessive contrasts of light and dark and much variety in coloring. So, for the most part, we will discuss photography away from home on the basis of films, with only an occasional word about orthochromatic, panchromatic or non-halation plates for special subjects and occasions.

Which Film? There are several varieties of roll film in the market, two or three different sorts of film packs, and at least one good, stiff flat film available in certain sizes, which can readily be cut to any smaller size desired. With the conveniences of roll film the reader is doubtless well acquainted; but the virtues of the film pack and flat, cut films are not, it seems to me, sufficiently appreciated. Among the different brands, choice must today be a matter of personal opinion, since they are alike in their reliability and general quality. Some makes offer a little more rapidity than others, and it is obvious that a supply of both ordinary rapidity and the more rapid kinds should be carried for use as may be indicated by the subject or circumstances. For myself, I use Kodak film, which, as made for use in Australasia, is a little speedier than the American film and seems to stand more handling. This may be accounted for by the fact that, for the greater part of the year, the Australian climate is very hot, and the handling of plates and films at the usual 60° to 65° Fahr. is practically impossible. The same applies to Australian plates, such as the Antitherm, which can be developed and washed at 90° Fahr. without much risk. This is a much higher temperature than is generally permissible in more

temperate climes, though it may be that the American and English "tropical" plates are very similar.

Cameras

About the choice of a camera let me say as little as possible, for the reason already given. Obviously, for travel photography, preference will naturally be given to equipment combining the largest efficiency with the least bulk and weight. In most cases, it will be a folding, roll film camera, and very often one of the innumerable varieties of so-called pocket cameras. If there is a special field for the pocket camera, that is, one taking pictures less than 2¼ x 3¼ inches, assuredly that field is photography away from home. So, if I were going to buy a camera for the trip abroad, and could carry only one, it would be a pocket camera, of the "vest-pocket" sort, as certain to give me the widest range of photographic possibilities and the biggest percentage of successful pictures. But the camera question is generally settled by the reader's purse, and should be considered in the light of that excellent philosophy which tells us that the best is the cheapest in the end.

Advantages of Simplicity

I have seen thousands of thoroughly good travel pictures made with the simplest form of fixed-focus camera, selling at about $10 (£2), and for a great deal of picture-making away from home nothing better will be needed or could be desired. Photography with such a camera is in fact photography with the bother left out. But the efficiency or picture-making capacity of such a camera is limited in a vital point, viz: its range of possibilities. Its successful use is confined to well-lighted subjects, without movement, situated at a fairly good distance away. It means the loss of many desirable subjects where movement is included in the scene; it means photographing between 10 A.M. and 3 P.M. on bright days, with little chance of success on dull days or in rainy weather, or in picture-making when the sun is still low—early or late. As a hand camera, *i. e.*, held in the hand, it will suffice for any subject that will give a good negative with an exposure of 1-25 or 1-20 of a second. Where the exposure must be longer, there will generally be blur or movement, unless

the camera is used on a tripod, when, of course, it will meet the requirements of almost any kind of subject, except such as include movement.

Larger Efficiency

From this simple camera at $10, one may go to almost any extreme in efficiency—and expense. But the increased efficiency is always worth the increased expense. The more expensive camera may be more complicated and less easy to handle; but it will give you a much larger control of varying subjects and conditions and widen the range of the pictorial possibilities of your journey immensely. As the writer of No. 125 of this Series wisely said: The pocket Icarette, taking pictures 2¼ x 2¼, fitted with an *f*/4.7 anastigmat and Compound shutter, and selling at $54 (£11), is worth all its cost just as much as the No. 1 Brownie, taking a picture of the same size, and selling at $1. (4/-).

Burke's Equipment

My experience has been with the better class instruments, and most of my work away from home has been done with a 3A Kodak, with an *f*/6.3 lens, color screen, portrait attachment, lens shade and—for occasional use—a tripod. Of course my Kodak is fitted with the Autographic back. This I consider an indispensable feature of a camera for use away from home, enabling one to make any desirable note on the film itself at the time of exposure. For use when the 3A is too bulky, I carry in my left-hand breast pocket a Newman & Guardia Baby Sibyl, which takes the V. P. K. film for eight exposures and has a lens working at *f*/4.5. There is no question about the efficiency of this little camera, provided you know how to handle it before you set out to use it in the field. Possibly any one of the many vest-pocket cameras using films, film packs or plates would be as well suited for the average traveler and his needs. These wonderful little cameras embody, to my mind, the greatest practical advance in modern photography. They combine the maximum efficiency with the minimum weight, bulk and bother; give pictures large enough for memo records of a subject and, properly handled, give negatives capable of yielding excellent enlargements up to 12 x 15 inches.

Graflex: Reflex: et al I need only mention the unquestioned efficiency and certainty of result peculiar to hand cameras of the reflecting-mirror, focal-plane shutter type, of which it is unnecessary to recommend any specific make. Having once mastered the use of such a camera, and some of them are really as simple and as "fool-proof" as a fixed-focus hand camera, one is equipped for any and every subject and circumstance, and no other type of camera can ever be as satisfactory. With a Graflex camera, in fact, one can photograph throughout the whole year, regardless of season and weather or time of day, and, with a modicum of care, get twelve good pictures out of every dozen exposures.

The Lens If the reader is confined to one lens—the lens on his camera—let it be the very best he can buy. Reference to almost any lens catalogue nowadays will inform the reader fully as to the difference between lenses of the achromatic meniscus, rectilinear or symmetrical, and anastigmat classes, such as are generally used today. It is therefore altogether unnecessary to go into such details here. The ideal lens, conditioned upon the bellows drawn or extension of the camera being sufficient to allow of its use, is the three-foci or "convertible" anastigmat, which gives three lenses, each different in focal length, with the maximum speed in each lens. The advantage of such a lens is based on the fact that the focal length of the lens used determines the scale or size of the picture image of the subject, and the angle of view or amount of the subject included within the base line of the plate or film used. Thus, for large images of fairly distant objects, such as a yacht at sea, the details of a church-tower, etc., a long-focus lens is required; for subjects at normal distances and picture images of normal or ordinary scale, a lens of focal length a little greater than the base measure of the plate used is generally employed; while for views of subjects which must be photographed in confined situations, such as houses in a narrow street or square, or for views including a wide angle, a lens shorter in focal length than the base of the plate is needed. All these

things, however, are treated at length in the lens books, to which the reader is referred. One more point, however: Use an anastigmat, whenever possible, in preference to the rectilinear or meniscus lens. Apart from its greater rapidity, when this is needed, the anastigmat gives more sharply defined picture images, which yield better enlargements.

Lens Information

Because the lens and shutter equipment is so vital a factor in getting results with the hand camera, I am going to venture, at the risk of seeming to advertise somewhat boldly, to recommend the reader to get and read carefully several numbers of THE PHOTO-MINIATURE in which the qualities and significance of hand-camera lenses and shutters are dealt with in detail, with a clearness and directness not equaled elsewhere within my knowledge. Thus, for a simple explanation of the choice and use of lenses in general, see P.-M. No. 79; for lenses to be used with pocket cameras see P.-M. Nos. 97 and 125; for those best suited to hand cameras of the reflecting mirror type, see P.–M. No. 99; and for clear-cut contrasts of the efficiency of different classes of hand-camera lenses in general, see P.-M. No. 132. With this information, obviously too lengthy to be repeated here, the reader is assured that he will know all worth knowing about the vital point of his hand camera.

Extras

Here I am sorely tempted to stop this discussion of the tourist's photographic equipment, with all its tedious detail. But hard experience tells me that, if I am to help the reader to get twelve good pictures out of a dozen exposures, it is not fair to leave him ignorant of the plain fact that a large percentage of his success afield with the hand camera will depend on the use of a color screen, lens shade and tripod. Well I know that the average reader will throw up his hands at the mere mention of these extras, as sure to complicate the pleasures of his hand camera work. Be it so. A tripod is a nuisance. A color screen does increase exposures so that a tripod is generally necessary. And a lens shade is so little used that I cannot find one mentioned in any American catalogue within my reach.

Tripod: Color Screen Nevertheless, the use of a tripod, the use of a color screen, and the use of a lens shade, does make such a world of difference in results that a single trial of anyone of them will suffice to change the reader from rebel to enthusiast. More than half of the misty, flat, veiled, poor negatives made with hand cameras are the direct result of the non-use of a lens shade. More than half of the blurred negatives which show movement of the hand or body during exposure are due directly to the lack of a tripod. Try to realize that the average person cannot hold the camera perfectly still in the hand longer than 1-25th of a second, and then think how many of our hand-camera exposures run from 1-5 to 1-15 of a second, and you will appreciate the practical advantage of a tripod. For a test of the difference resulting from the use of the color screen, take two pictures of the same subject, at the same time, from the same standpoint. Give the first a normal exposure with the camera held in the hand. Put the camera on a tripod, and adjust a Kodak color screen (if you are using Kodak film) on your lens, and give this twice the normal exposure. Develop the two exposures together for the same length of time and compare the prints. No further advice from me will be needed after this practical demonstration.

Portrait Attachment The little supplementary lens called a "portrait attachment" is, in my opinion, an indispensable convenience for any hand camera without a focusing screen. Do not let its name mislead you into thinking that it is useful only for making portraits of people. Apart from this it is really more useful in general work of all kinds, where a large image of any small or nearby object is desired, as, for example, flowers, blossoms, details of carved work, etc. These attachments, sometimes spoken of as "magnifiers," are slipped over the usual lens on the camera, and are obtainable in different sizes for different lenses. They are used at certain fixed distances from the subject, which distances are stated in the leaflet accompanying the lens, and must be accurately measured at the time of photographing. A

tape measure about five feet in length, or a piece of string knotted at the correct distance, will serve to get the focus quickly and ensures a sharply defined negative when the attachment is used.

Tripod Facts

The choice of a tripod is a matter of personal opinion. Many good makes are of metal, collapsible and convenient to carry, but I prefer a fairly stout wooden tripod, such as the "Jaynay Quickset." If accidently broken, this is easily repaired in the woods or by a local carpenter; whereas, if a metal tripod "sticks," refuses to collapse or extend, or is broken or bent, repairs are often a matter of much difficulty. Use your camera on a tripod whenever possible, stop the lens down or use a color screen and give a time exposure. You will be surprised by the gain in quality in your work. Your negatives will be more harmonious in gradation, the definition will be improved, the glaring contrasts of tone due to under-exposure will be absent, you will get detail in your shadows and a finer rendering of planes and values. And with such a negative you can later get the most desirable enlargements or lantern slides, or, if you will, platinum prints of rare quality. For a good example of this sort of treatment, see the view of "Frenchman's Bay, at Bar Harbor, Mass.," on page 276 of the "Photo Era," June, 1915, an open landscape, photographed at 2 P.M. in July, with an exposure of 10 seconds. Note, also, that one half of the composition is filled with distant sea and sky!

Lens Shade

The practical advantages of a lens shade are fully appreciated by most professional portraitists, and in one form or another this help to better negatives is widely used in Europe and "down under" where I live. Why it is so little known or used in America passes my comprehension. It serves to keep the glare of light reaching the lens from all directions from entering the camera, cuts off extraneous light and gives negatives conspicuously free from fog and veil. For photographing against the light it is simply indispensable. The one I use on all my negatives is the model made by Newman & Guardia. But any device in the way of a black-

ened tube or funnel of black paper, attached to the lens flange and not cutting into the field of view, will serve the purpose.

Know Your Outfit

If it should happen that the reader plans to start off on a holiday away from home with a new camera, let me urge him to spend at least an hour or two in quietly testing its performance, and making himself familiar with its movements before the journey begins. This will save many a heartache afterward, and will assuredly make for better results in any event. I dare not here go into details as to these tests of lens, shutter, finder, and focus scale, nor do more than mention the necessity of preliminary practice in estimating distances, finding the subject, holding the camera in different positions, and what not. These things are fully covered in The Photo-Miniature Nos. 99, 107 and 132. Suffice it to say here that nine-tenths of the failures, waste, disappointments and expense which befall the amateur result simply from neglect in these obvious essentials; the lack of knowledge of the camera and its movements; what it can do and what it cannot do.

Stereoscopic Photography

For the one man in a hundred, who wants to get the most out of his holiday with the camera, regardless of a little bother, let me say just one word for the stereoscopic camera. Without any doubt, the stereoscopic picture, with its perfection of detail and illusion of relief, is the most perfect product of photography and makes one content to miss even the charm of color. The making of stereoscopic photographs, however, is beyond the limits of my space here, and I must refer those interested to The Photo-Miniature No. 98, wherein the story is told by an enthusiast. In my stereo work I use the Verascope Richard with great satisfaction.

The Camera Case

Out of a hundred persons who possess cameras, possibly one will have a leather case in which to keep it. This is an item which the photographic tourist cannot afford to overlook. Have a stout leather case for your outfit and get a good one. Real leather, preferably tan-colored, is the best material, looks well

and wears longer than anything else. Such a case protects the equipment from wear and tear, from light and weather and, if it has a good lock or fastener, from the over-curious people who abound, and who are responsible for many spoilt plates and films. Hotel and country boarding-house servants, small boys in families and ship stewards are the worst offenders. Keep your camera, film spools and holders, lenses and shutters, secure in a good stout case and you will never regret the cost and extra weight involved.

Keep Your Lens Clean

Another point often overlooked when away from home on a photographic trip is the care needed by the lens. Keep your lens clean at all times. Beware of moisture and condensation caused by quick changes of temperature. When working out-of-doors, beware of grit and dust; flick the surface of the lens carefully with a very soft rag before touching it to clean it. Keep the lens covered from light when not in use. Strong sunlight discolors the balsam which cements the combinations of the lens together, and a dirty lens, or one in which the balsam has become yellowed, means under-exposed and fuzzy negatives. A clean, soft handkerchief is the best material for cleaning the delicate surfaces of lenses.

Exposure

Perhaps the most important factor in photographing away from home is the exposure. Generally the conditions are altogether different from what one has known at home. Among the mountains, in the valleys or canyons, above the timber line or amid the snow, along the seacoast, on the Pacific or Atlantic shores, in Bermuda, Cuba or Jamaica, in the Northland or down South, in widely separated cities and streets perchance full of color, it is naturally difficult to correctly judge exposures, no matter how experienced one may be. A familiar knowledge of the different factors peculiar to the problem will help. This can be obtained from a careful reading of a good handbook, such as THE PHOTO-MINIATURE No 105, or the Watkins' Manual of Exposure. But the best and surest way for the traveler in strange places is to distrust his own skill in calculation and use a reliable exposure meter. Heyde's, Wynne's,

or Watkins' meters are quite inexpensive and will give you the correct exposure under any and all conditions, thus repaying their cost many times within a year.

Duplicate Exposures

For the reader who cannot be persuaded of the practical wisdom in the foregoing paragraph, I offer the suggestion that where the subject is an important one, or the picture especially desirable, the exposure should be duplicated. In this plan, the first exposure should be that estimated at normal, and the second exposure double the previous exposure. That is, if you estimate 1-50 of a second at *f*/8 to be correct, expose a second plate or film 1-25 of a second at *f*/8. This is, of course, a much more extravagant method than the intelligent use of an exposure meter, and yet, strange though it may seem, it is a method followed by many old and experienced photographic travelers who go abroad and photograph for business purposes, such as lantern lectures and the like.

Public Darkrooms

A word of caution should be given as to the use of public darkrooms, found in hotels, drug stores, etc., more commonly in European countries than in America. My experience of such places is not happy, and is a strong argument in favor of the use of rollfilms, which (with a tank) may be developed, as the camera may be loaded, in daylight or an ordinary room. When obliged to use a public darkroom, it is well to provide oneself beforehand with a newspaper or two, and to spread this over the table or bench on which plates are to be handled or changed or loaded into holders. It is advisable, also, in such places, to shut the door and wait a few minutes before doing anything, to let the eyes become accustomed to the darkness, when any stray clinks of light coming from unexpected places will make themselves visible. In changing plates in such rooms, keep the plates well away from the "safe" light provided, and shielded by the shadow of the body. Cover them as soon as removed from the holders and repack them face to face in the boxes from which fresh plates are taken, sealing the boxes with gummed tape for the sake of precaution.

Exposures in Sunlight

A common mistake made by tourists is to suppose that clear atmosphere and strong sunlight mean short exposures. The reverse is generally nearer the fact. The stronger the sunlight the greater the contrast, and it is the contrasts for which allowance must be made by generous exposure. This applies especially to Australasia, India, Egypt, along the Mediterranean, in Jamaica, Bermuda, Southern California, and along the Florida coast. A short exposure in sunlight will give a harsh negative, with the high lights hard and glaring, and the shadows disproportionately heavy and black. "Soot and whitewash" properly describes such negatives, and it is hopeless to expect good prints from them. There is no real excuse for such failures; an ample exposure would give true tone gradation, with detail alike in lights and shadows, despite the naturally strong contrasts. This is peculiarly true of sunlight on snow, in which a color filter such as Wratten's KII will materially aid in equalizing the abnormal light and dark scale. A full exposure, with care to avoid over-development, is the key to success.

Against the Sun

With this precaution and the use of a lens shade, exposures in sunlight, when carefully handled, will often give most pleasing pictures of a wide variety of subjects. In most of the instruction books we are warned against attempting to work directly facing the sun; but my experience has shown me that charming light and shade effects may often by secured by working in just that way. Especially in outdoor portraiture is this method effective. For examples see the veranda group and the "Maori Woman Greeting Visitors" among the illustrations of this number.

Shading the Lens

All these pictures were made on films or backed plates. Notice the absence of halation and the roundness of the modeling of the figures. The lens, in each exposure, was carefully shaded from the direct rays of the sun, which were streaming toward the camera. The prints afford a convincing demonstration of the value of the lens shade. This, as already mentioned, may be a com-

mercial article, such as that made by Newman & Guardia, or it may be improvised from a blackened cardboard tube or a black paper funnel fitted over the lens tube, care being taken that it does not project so far as to cut off the light from the corners of the plate or film. Another makeshift method, which has proved equally effective in outdoor portraiture, is to stand under an umbrella held by another person or fixed by a stick into the ground, or where the point of view permits, to stand under a veranda or the shade of a tree. The improvement in the technical quality of negatives made with a sky shade is, to my mind, remarkable enough to warrant my urging its use on the reader who takes pride in his work, and I hope that some American manufacturer will take the hint and give us a simple, inexpensive lens shade especially devised for the lenses on our hand cameras which, at present, have practically no protection in the way of a hood to keep out extraneous light.

Disregard Weather

Among the minor advantages of a camera trip away from home is the practical experience that photography does not necessarily mean fine, clear, weather; but that there are picture-making opportunities in all sorts of weather and regardless of atmospheric conditions. The fact that the traveler is here or there for only a few hours, or a day or two at most, forces him to take every chance for an exposure, since he may not have another chance to get his subject. So, as every traveler knows, rainy and dull days, wet evenings, misty and stormy atmospheric conditions, snow and wintry weather, are by no means fatal to good photography.

Rainy-day Work

For hand camera work, without a tripod, on rainy days, a lens working at $f/6.3$ or faster is, of course, a decided advantage, as permitting of street scenes or other subjects including movement. But even with less rapid lenses, as $f/8$ or $f/16$, such as are fitted to inexpensive hand cameras, much profitable work can be done with a little thought and care in exposure, in the choice of the right moment, and in securing a support of some kind for the camera during the exposure. Sometimes

it is possible to steady the camera sufficiently for a half or full second exposure, by holding it against a lamp-post, pillar, fence or similar support. In parks or public gardens, exposition grounds, etc., there are many conveniences, such as benches, projecting architectural details or ledges, etc., which may be utilized for time exposures. Wherever possible, a bright wet day, rather than a dull day with sky heavily overcast, should be chosen. If the day is one when the sun glints through the clouds occasionally, so much the better.

If the rain is falling when the work is done, care must be exercised to shield the camera and lens, the latter being carefully wiped dry with a clean rag between or just before exposures. A handy contrivance for wet-day photography is a roomy umbrella, with a crooked handle, which can be held (open) in the front of oneself and secured by a strap passed around the chest. This gives adequate protection against a steady drizzle, and leaves the hands free. The reflections of wet streets are very helpful in rainy-day work. Often it will be found that the late afternoon of a wet day offers a favorable opportunity for camera work in cities and in the open country, when the western sky is filled with light and fine cloud effects are generally available.

Exposures

The exposures will vary according to the conditions, the rapidity of the lens available and the character of the subject. With a quick lens (*f*/6.3) and a gleam of sunlight, exposures may be even as fast as 1-25 second; but for the majority of rainy-day views from one-half to a full second will be required, the camera being supported on a tripod or steadied against a support during the exposure. Err on the side of over-exposure if at all, and use a soft working developer, such as metol-hydroquinone, eikonogen or rodinal, to avoid hardness and lack of detail in the shadows.

One has little need for color screens or ortho plates for this sort of work, everything being toned down to a quiet gray. But if we work toward evening, the contrasts of light and dark, or the lights of the street, will necessitate the use of rapid films or backed or non-halation plates.

Night Pictures

The pictorial possibilities of photography at night are all too generally neglected; but, whether the traveler find himself by a campfire, or at a summer amusement park, or at an exposition, he should not overlook these opportunities for securing interesting memoranda of his trip. The conditions are, to be sure, very different from those governing daylight work, and a little patience and enthusiasm will be needed, but the results will abundantly repay the bother involved. Films, non-halation plates or backed plates are essential for this work, and exposures will run to minutes, so that a tripod is essential; although an English amateur has shown a few successful "snapshots" made with a hand camera at night, in a brilliantly illuminated theatre district. For such work a very fast lens and extra-rapid plate or film must be used; much depends on the choice of the point of view and the right moment for exposure, to avoid blur from moving figures in the scene. See The Photo-Miniature, No. 104.

In open streets, with a lens at *f*/8, the exposure will be from ten to fifteen minutes. The character of the subject, however, largely influences this detail. Thus I have secured a pleasing picture of a public library exterior, well illuminated, with an exposure of five minutes and the lens at *f*/11. But another view of the same subject, with dark masses in the foreground, required twenty minutes. For a summer night festival or night work at an exposition, where we have small areas brilliantly illuminated, sometimes with colored lights, as when the subject is an illuminated arch or tower or electric fountain, ortho plates or films are desirable. With a lens at *f*/8 or speedier, a tripod exposure of two or three minutes will suffice. Of course this will give a picture largely composed of unrelieved darks, with the subject in well-lighted relief.

Moonlight

Night scenes by moonlight are attractive subjects when we have a full moon and snow. Such subjects, therefore, are available only for those who take their holidays in winter or among the Canadian Rockies, the Swiss Alps or Alaska. I have seen not a few interesting

pictures of this class, the result, naturally, of much patient skill and enthusiasm on the part of their makers. The exposure for such a subject, as far as it is possible to generalize, will extend from five to thirty minutes, depending on the illumination of the scene and its character. A rapid lens (*f*/6.3) is desirable, and double-coated plates seem to be generally advised, though some of the best work I have seen was done with ordinary Kodak film.

Alpine Work

What is generally spoken of as alpine photography really includes all mountain work in winter or high peaks or ranges covered with snow and ice. Thus you can have all the alpine experience you desire in the hills of New Hampshire, the Rockies, and Alaska, just as well as in New Zealand and the Swiss Alps. I have had some little experience in the Mount Cook district of New Zealand, where the Alpine scenery is said to equal that found anywhere in Europe, and my suggestions are gathered from that experience.

My last trip was in 1914. I had been over the ground before, at which time I had used plates exclusively. On this trip I, and two others of my party, depended entirely on Kodak films except for a few plates exposed in my stereoscopic camera. It is a tribute to the roll film to say that the results obtained with films fully equal those of my former trip when plates were used.

For snow- or ice-clad mountains, a color screen to diminish or cut out the blues, which are so pronounced, is a necessity; so, before leaving Sidney, I made exhaustive tests of all the screens available. My decision was in favor of the Wratten KII screen, as giving me a slight over-correction, and holding all snow-clad peaks and light clouds against a blue sky, while giving detail and contrast in the ice formations.

The day after our arrival on the ground, we made an excursion to a nearby glacier to test out our theories. All our exposures were calculated independently, first with an exposure meter, and then checked with an exposure table of proved reputation. These test exposures were immediately developed in a tank, and

the results in practice showed that, using Kodak film with a Wratten KII screen, and the lens stopped to *f*/22, the correct exposure for most subjects including ice-peaks against the sky, in summer sunlight, was one-tenth of a second. For subjects with heavy masses of rock in the foreground, or for work at early morn or late in the afternoon, of course the exposures should be proportionately increased.

Results

Between the three of us we made over six hundred exposures, all developed in the tank on the spot, and turning out without any failures worth mentioning, save such as were obviously due to carelessness or lack of thought on our part. Practically all the exposures were made with the cameras on tripods, and considering that the use of the screen necessitated multiplying all exposures by eight, the experience proved how very fast the light is among ice- or snow-clad mountains.

Before we left the locality, a well-known Canadian climber joined our party and, after seeing our results, persuaded me to leave my Kodak and screen with him. This I did, also giving him full data as to exposures, etc. He continued working in that district for almost three months and later reported to me that out of four hundred exposures he had less than ten per cent failures, which showed that the working out of experimental exposures before beginning actual work is practical wisdom, as giving an actual basis on which to work.

For most of my mountain work I have used the ordinary Kodak color screen and films. This screen, I understand, is a Wratten K 1½, multiplying the normal exposure five times. It has given me fine results as far as its correction goes, and for average outdoor work with subjects including color nothing better can be desired. For snow and ice subjects, however, I prefer the over-correction given by the Wratten KII screen.

Handling Crowds

In photographing in crowds at a public function or procession, or in the streets of a busy city, one of the great difficulties is to avoid the persistent attentions of the

curious, who will crowd around and in front of the camera. This is a difficulty which calls for common-sense and resourcefulness rather than any photographic knowledge. If it is a group or crowd which bothers, one remedy is to seem to humor them, and especially the one or two persons offering the greatest obstruction, and then, at the right moment, quickly turn and adjust the camera for the view desired and make the exposure. So in photographing buildings or views on a crowded street, keep your eyes open for the opportunity and, at the right moment, wheel about or lift the camera to the proper position, or stand and find your subject properly in the finder, making the exposure before those about you have time to interfere in any way.

Examples

I recall an instance. It was a performance of the Fire-Walking ceremony on the Island of Bega, in the Fijian group, given only at rare intervals. There was a big crowd of natives and no evidence of "race suicide," so that the youngsters fairly mobbed us. We tried every known device to scatter them, without avail. Finally, an old gentleman in our party, himself an ardent camerist, called the children about him, took out his set of artificial teeth and shook them at the youngsters. There was a clearance in quick time, and they would not come near our party for hours after.

For work among natives or wherever there are many young children, I have found a few cheap, showy toys, carried in my pocket, most useful to gain favors. Penny squeakers or noise-making toys are best. With the older natives, buttons with portraits of royalties or famous persons are often a big attraction. On one occasion, where the Fijian native police were unusually officious and threatened to block any attempt at picture-making at a big public function, I worked my way through the crowd and, selecting an imposing native officer, pinned on his chest buttons with portraits of the King and Queen of England. I was immediately besieged by his fellows and, after carefully distributing all my available store of buttons, quickly had every facility afforded me for photographing all over the place.

It is by such devices, some of malice aforethought, and others prompted by the circumstances of the moment, that one often wins success with crowds.

Crowded Streets

When possible, I prefer to get some position slightly above the crowd for my photographing at public affairs, where it is not possible to get in front of the crowd. This is often simple in photographing in crowded streets, where one can utilize the steps of doorways or other projections of buildings affording a foothold.

Avoid General Views

As far as possible the traveler will be well advised to avoid general views. Especially with the small cameras so popular today, views of a panoramic character are generally disappointing. Concentrate on the small "bits." These are what tell most in a collection of travel pictures. The doorway of an old cathedral or public building, with people streaming out from it; a pictorial corner of an outdoor theater; a choice bit of shipping in a corner of a harbor, or a single building at a world's fair, will tell the story just as well as a panorama, and is really more interesting. The big, general view involves many difficulties, such as a big plate of the ortho or non-halation sort to cut out haze, a carefully adjusted color screen, long-focus lens, and so on. But anyone with the seeing eye can pick out the little centers of interest in a scene and get satisfying pictures of them.

Views from Trains

Sometimes as the tourist approaches his destination, per train or steamboat, he will get glimpses of scenes which are deserving of record. Now and again, it will be possible to get these records of the journey during a train-stop of a few minutes, or when the steamer ties up for an hour or two at an intermediate port on the journey. For these last opportunities no special instructions are needed; but it may be worth while to give here a few hints on photographing from trains and boats in motion.

The rule here is that which applies to photographing moving objects from a stationary base, but the conditions are reversed,—the boat or train moves and the

subject is stationary. Question: How to get a picture without blur of image or movement. It is assumed that the reader has his camera ready for exposure, and can assure himself of steadiness and freedom from movement in his own handling of the camera. Then (1) If the actual movement of the picture image on the film during the exposure does not exceed 1-100 of an inch, the picture will be satisfactorily sharp in definition. Suppose the train to be traveling at twenty miles per hour. This equals thirty feet per second. With a lens of six inches focal length, we can set the shutter at 1-30 second, or at 1-50 second if the light is fairly bright, and obtain a sharp picture of objects not nearer than fifty feet away. This presumes a lens working at *f*/8 or even *f*/11, with the light falling on the subject from behind the worker. (2) If the subject is at right angles to the line of travel, i.e., when the train is going directly across the field of view, the displacement of the image on the film will be much greater than if the subject is viewed at an angle of 30° to 45°. Hence it is better to photograph subjects as we approach or recede from them at about this angle. This movement of the image on the film is greater for near than for distant objects. Avoid including objects nearer than fifty feet.

Possibilities

It may be taken for granted, therefore, that with the ordinary hand camera only fairly distant views are possible, and that side of the train should be chosen which gives a view free from the disturbance of telegraph poles or other roadway obstructions. As the train sweeps around a curve or bay, or approaches a picturesque turn in the hills or an old town, are favorable chances for such exposures. An angle of 30° to the train's direction, looking ahead, or at the same angle, looking back, should be chosen. Take a firm, well-balanced position at the window, with the camera slightly projecting and ready for exposure. Watch the image on the finder, see that the sun is not shining into the lens, and release the shutter at the most favorable moment. Success will depend chiefly on a favorable combination of the right lighting of the subject, choice of viewpoint, and certainty of manipulation.

From Steamboats Photographing from steamboats is simpler than train work because of the greater steadiness or freedom from vibration. Generally, the camerist has more freedom of location and can steady himself more easily. There are no telegraph poles, and the abundance of light on river and at sea makes short exposures possible, thus eliminating chances of movement during exposure.

Work from the bow of the boat, using view angles of 30° to 50° from the side of the steamer giving the most favorable view. Hold the camera in the hand (not steadied on the side of the boat) and keep it level. Avoid including projections or parts of deck-houses on the steamer's deck. Remember that views of objects passed at right angles will require much shorter exposures than where the subject is passed obliquely, approaching or receding. The best time of day for this sort of work is during the early morning hours or between 3 and 4.30 P.M. When the sun is low and obscured by clouds, desirable effects can often be obtained by working against the light. A carefully adjusted finder and skill in its use are big helps.

On Board Ship Photography on board ship chiefly interests the ocean traveler, and will largely be confined to views leaving port, the life of the decks during the voyage, an occasional cloud panorama, and the arrival at the port of destination. Photographs of the sea, waves, etc., are rarely possible, because of the height of the deck above the water which dwarfs the irregularities of the surface of the sea even during a storm. There are, however, many interesting subjects around a boat when the trip covers a week or ten days, and the traveler will do well to keep his eyes open and camera ready for these opportunities. The incidents of the voyage, the groups which gather at the rail when something is sighted, the occasional boat-drill, deck games, etc., will all furnish pictures of interest for the record of the trip.

Along the Seacoast Seashore work calls for little special instruction here, although an interesting book might be written about the pictorial opportunities along the seacoast. Those who

can find copies of THE PHOTO-MINIATURE Nos. 28 and 71 will find the whole subject fully covered therein at length. For shore work, on the beach itself, there are subjects at every turn, and the roll film hand camera, with its facility for changing films after each exposure, offers undeniable advantages. The light is usually bright and superabundant, so that the simplest lens and shutter equipment will generally be equal to all needs. A skyshade, or an umbrella, so adjusted that the photographer can work under it comfortably, will be found to be invaluable as shielding the lens from overmuch light reflected from beach and sea and sky. Remember to use large stops or lens apertures when photographing near objects or groups; stop the lens well down, as to $f/22$ or $f/32$ for well-lighted views not including objects nearer than twenty-five or fifty feet. Most of the exposures will run from 1-25 to 1-100 of a second. For views of sea and sky, work from lower than standing level, e.g., kneeling, and use $f/45$ or $f/64$ for all hours later than 9 A.M. and before 4 P.M. At all times be careful to shield the lens and shutter from spray or flying sand. It is better to keep the camera closed and under an arm or coat when not in use. A piece of oiled silk, sufficiently large to cover the lens and shutter, fastened with a rubber band, should be fixed in position when the camera is not in use but is kept open ready for exposure, as protection from sand and spray. A color-screen is one of the most useful of photographic conveniences for seashore work. Do not forget the increase of exposure it entails, which detail may be compensated for at times by using a larger stop in the lens. Where the exposure, with the color screen means an increase beyond 1-25 of a second, a tripod is essential. Wooden tripods are advised for all seashore work, as the collapsible, sliding-tube metal tripods invariably stick and jam, the result of sand blowing into the tubing.

Surf Pictures

Surf photography, a field abounding in the most remarkable pictorial and photographic possibilities, cannot be more than mentioned. For the traveler spending a few weeks on the coast of New England, northern Cali-

fornia, the south coast of England, or along the Mediterranean, it offers a thousand pleasures. To such I can only suggest a careful reading of Mr. Mortimer's admirable handbook on the subject in THE PHOTO-MINIATURE No. 71, now out of print, but accessible at many public libraries. Surf and wave pictures are rarely, if ever, possible at the flat bathing-beaches, where so many spend their holidays, since the surf rarely gets above the horizon line and the height of the waves is generally insignificant.

Photographing Yachts

Yacht pictures can sometimes be secured from the end of a pier or dock. A still better vantage point is the stake-boat when a race is on. But the most successful photographs, showing life and motion, are usually secured from the lower viewpoint of another boat, navigated to meet the desires of the photographer. In working from the deck of an excursion steamer, the manipulation of the camera does not present much difficulty. When one has to work from the deck of a boat or tug, as is often the case at regattas or races, success is not so easy of accomplishment, and depends as much upon self-control as upon photographic skill. A good deal depends, too, upon one's knowledge of the best views of this or that class of craft under varying circumstances for a vessel viewed from different viewpoints presents widely different aspects, and every kind of sailing craft has its own peculiar characteristics, which should be secured in the picture. A broadside view rarely gives the most favorable impression, and is not easy to secure, because the speed of the vessel is more difficult to contend with from this viewpoint than from others. A three-quarter front view, on the other hand, will generally offer good curves, and a pleasing *ensemble*, with plenty of life and "go." When a yacht approaches, bowfore, with the water beaten to a froth beneath her bow, a very satisfactory result may be secured if one has a steady hand and knows just when to release the shutter. When first seen on the finder an approaching boat seems to move comparatively slowly, but when within hailing distance she will increase in size and seem to suddenly fill the view with her canvas. When

to expose in such circumstances can only be learned from experience and the use of an accurate finder. The novice should not forget that the successful yacht-studies seen in the shop-windows represent many failures, even if they come from workers famous in this specialty. Steamships, or sailing vessels with abundant canvas, usually give the best view three-quarter front; sometimes a broadside view will be pleasing if we can have a cloudy sky behind to throw the sails into relief and give a sense of atmosphere. A rear view of a steamship will rarely be satisfactory, but if we get a full-rigged sailing vessel stretching all her canvas against the sun, a charming semi-silhouette effect may be secured, adding sentiment to the picture. This effect is emphasized if the sun be low and the sky marked by horizontal lines of cloud indicating repose. Pictures of small vessels lying at anchor in still water, such as may often be made from the wharves or docks of a harbor, are very pleasing, if treated pictorially. The lighting of the subject is here a matter of importance, and this should be so managed that shadow effects on the water are made to help the composition.

Exposition Pictures

So many camerists will journey westward this year to see the San Francisco and San Diego expositions, that a few hints on photographing at these great world's fairs will be helpful. Probably never before in the world's history has the amateur had so wonderful a variety of hand-camera material right in his hand, as it were, as the California tour of 1915 offers. The Pacific coast is, indisputably, unrivaled in its wealth of beauty, sunshine and flowers. To these the Expositions add a vast array of magnificent buildings, big and little, arranged with consummate skill to harmonize with their surroundings, with the sea as fitting background.

The Most Important Factor

Since both expositions are located in or near important cities, the question of photographic supplies and conveniences presents no difficulties, and the traveler need carry nothing more than he needs for the day. The largest percentage of good pictures will obviously fall to the worker who plans out his day's picture-making before-

hand, studying the maps of the exposition, to see at what hours of the day the light will be most favorable for the different views desired. Do not overlook the fact that, in all outdoor picture-making, the illumination of the subject is the most powerful factor in winning success. This applies with special force wherever buildings of notable design are concerned, as at the expositions.

The placing of the building or group of buildings, the choice of the most desirable viewpoint, the selection and arrangement of the scene, and the exposure, are all important. But the illumination is the deciding factor and deserves the most careful attention.

Exposure

As far as exposure is concerned, remember the caution that intense sunlight and clear atmosphere do not necessarily mean very short exposures. Visitors from the East, accustomed to grayer skies and more dull weather, should heed this warning. Hand-camera exposures will rarely be more rapid than 1-25 second, and this will call for the most favorable conditions. If it is possible to hold the camera steady, the reader is advised to cultivate the expert hand-camerist's habit of giving longer exposures. There are many who aver that exposures of 1-15 and even 1-10 second are quite practicable with the camera held against the body, under the arm or against the chest. Such an exposure means a better negative as a rule, with better values and a more pleasing separation of the planes. A few experimental exposures will determine what can or cannot be done in this direction.

Color

The superabundance of color, peculiar to these two expositions, is likely to deceive the inexperienced in the matter of exposure. Strong color contrasts invariably call for longer exposures than usual. Hence the reader who will be advised will carry a small, collapsible tripod for much of his work, despite the little extra trouble this involves. It may be that this will mean an extra fee or special permission from the authorities, although I believe that no restrictions govern the use of a tripod, or large cameras, if these are desirable.

Use a Tripod

With a tripod, of course, the use of a color screen is possible, and this means a still larger percentage of satisfaction and success. A 3-times or 5-times screen is advised as likely to meet all the requirements. If the camera is adapted for plates, by all means use ortho or double-coated plates. Unless considerable movement is likely to be included in a scene, there is no need for any worry as to rapid or extra-rapid plates. The average plate or film will do the work, and generally the lens will be stopped down to *f*/11 or smaller, to get as much definition as is possible. Some of the most pleasing exposition pictures I have thus far seen were made with the lens stopped down to *f*/32 and exposures ranging from 1-2 to 5 seconds, a color screen being used. These were tripod exposures, of course.

Get to Know Before You Go

Broadly speaking, the amateur's success will very largely depend on his skill in using the finder on his camera and in judging distances, together with his use of the focusing scale on the camera. Space does not permit me to deal with these things at length here, hence I refer the reader to earlier numbers of The Photo-Miniature in which they are fully discussed. Nos. 97, 99, 107, 117, 125, and especially No. 132, will provide much useful information on these important details. A careful study of what can be done with a fixed-focus camera will be most helpful, and it should not be forgotten that any folding, focusing film or plate camera can be utilized as a fixed-focus instrument, with all the advantages "pertaining and appertaining thereto," as the law-books say, by setting the focusing scale-pointer and adjusting the lens-stop so that all objects beyond any given distance will be in focus, and then working with the camera so adjusted without further change. The means and method for this adjustment for different lenses is given in detail, with a handy table of hyper-focal distances in The Photo-Miniature No. 132.

Night Photography

For night photography at the expositions, a support of some sort for the camera will be essential to success. If

this can be secured, as mentioned under "street scenes" or by means of a clamp, then non-halation plates or films, a lens stopped down to *f*/22, and exposures of from 2 to 15 minutes, will give pleasing pictures of the average subject, including more or less illumination. A practical knowledge of camera work at night will be found most helpful, and this can be had in THE PHOTO-MINIATURE No. 104.

Southern Colorado

On his way westward, the reader may elect to spend a few days with his camera in southern Colorado, as, for example, along the Alamosa and Conejos rivers, tributaries of the Rio Grande, formerly the home of the Ute, Navajo and Pueblo Indians. All this country is rich in pictorial material, densely wooded mountains, snow-clad ranges, beautiful rivers, and rock-lined gorges hundreds of feet in depth. Wild game abounds, so that a camera of the reflecting-mirror type is desirable. Those who do not care for bear, deer or coyote pictures can meet all their landscape requirements with the ordinary roll-film, filmpack or plate camera. The post card size is as small as travelers advise, everything being on so large a scale that the pocket camera disappoints one, except for "bits," camp life, etc. Much climbing and walking is necessary, hence the desirability of taking one camera only on an outdoor excursion. Mr. Charles O. Axtell, in an article in the *Photo Era* describing his experiences in this territory, advises the use of ortho plates, color screen and tripod, which means time exposures. Hand-camera exposures, of course, must be made without a color screen and usually with films. Contrary to the usual experience, Mr. Axtell tells us that exposures in Colorado should be shortened, by reason of the extremely clear atmosphere. He suggests the use of an exposure meter until the traveler is accustomed to the differences between this and his usual outdoor work.

Mountains in Winter

Writing of his experiences in photographing in snow and ice-clad mountains, and especially where sunlight and snow are concerned, Mr. Will Cadby confirms Mr. Burke's advice to use a lens shade (one which completely

urrounds the lens) for every exposure, with a Wratten K I or K II screen, and orthochromatic plates, preferably backed or double-coated. The K I screen was that generally used as giving normal correction, and enabling one to cut down the exposure to only twice that required with a screen. Mr. Cadby also mentions his successful use of the filmpack where plates are not available, and others seem to have had success with roll-films as Mr. Burke points out on another page. Mr. Phil. M. Riley, telling of his experiences during a winter holiday among the New Hampshire hills, says he uses an ordinary hand camera, with self-screen ortho plates, non-halation plates, and films with a three-times screen, indifferently. During the hours at the middle of the day he gives exposures equal to summer-time exposures, the snow making up for the loss of strength in the light; but at 9 A.M. and after 3 P.M. he suggests that the exposures be multiplied four times what would be required at the same hours in summer or at ordinary altitudes. He emphasizes the value of the color screen as giving more pleasing renderings of snow, especially where sunlight is included in the view, and also as harmonizing the contrasts between snow and dark trees, or shrubbery. Almost all the work he describes was done at locations over two thousand feet above the sea-level.

Among the Lakes

Writing of a fishing trip among the Maine lakes, near the Canadian border, Mr. F. Davison tells us that he got a full hundred successful negatives out of one hundred and thirty exposures on all kinds of subjects. The trip was made, in part, by canoe or on foot; the camera was the ordinary folding, roll-film instrument, with an $f/6.3$ anastigmat and a shutter working up to 1-150 second. The full opening of the lens and fast shutter speeds were used only for near-at-hand subjects, including movement; for open work from the canoe, out on the lakes or over the open country, the lens was stopped down to $f/32$, and exposures ranged from 1-25 to 1-100 of a second. For picture-making along the shores or under the trees, where dark or heavy foliage was included in the scene, exposures of 1-10

second (without a tripod) were generally well timed. The chief difficulty experienced during the trip was the correct estimation of distances, most of the early failures being due to incorrect focusing; but this was overcome by fixing the stop and focusing scale pointer so that, with *f*/32, everything beyond twenty feet was sharply defined in the resulting picture. Twenty feet happened to be the length of the canoe, so that this provided the handiest "measuring tape" one could desire.

In the Cascade Range

One of the most delightful places in this country for a camera holiday is to be found in the Cascade Range, extending from northern California into British Columbia, including an illimitable variety of subjects from glaciers, lakes and evergreen-lined valleys to snow-capped peaks lifting their heads to an altitude of over 7,000 feet above the snow-line. For such a trip a telephoto attachment, a stoutly built tripod, and a selection of color screens are among the necessities, although the hand-camerist will find plenty of material for his film camera minus any of these extras. I quote from an interesting article on this region by Mr. A. H. Barnes, which appeared in the *Photo-Era* of last September.

Mt. Rainier

Of picturing Mt. Rainier (Tacoma) from a distance of forty miles, with a telephoto equipment Mr. Barnes says:

"Both professional and amateur have found the photographing of this distant subject a source of disappointment. The negatives produced are very inferior to what is expected of them. They are dim and valueless, and often show no evidence of a mountain at all; and yet to produce a negative with all the contrasts of the mountain itself is very simple with careful manipulation. Here two extremes combine to try the capabilities of photo-chemicals. For pictorial reasons it is necessary to compose this far-away object with trees of the immediate landscape, which aid by giving distance and altitude to the subject. The accompanying trees are usually those of the dark evergreen type, the color of which is of the least actinic value requiring a long exposure; whereas the mountain, forty to sixty miles distant, stands on the horizon displaying the white,

blue, violet and ultra-violet rays of highly actinic power requiring the least exposure. . . . . As there is no contrast to spare in the distance, it is well to use a filter of full color-value and not one that is too pale. The plate used should be sensitive to the yellow color of the filter, like the Isochromatic plate. A long-focus lens is generally used to photograph this mountain from a distance. With the smaller stops this necessitates an exposure of thirty to sixty seconds, even with the most sensitive plate.

"The worker with a telephoto-attachment will find the mountain a good subject from a long distance. The adjustment of the attachment makes it possible to get pictures of various sizes, whereas a long-focus lens always gives the same results from a given point of view, although the long-focus lens is more simple to manipulate. I used a lens of 26-inch focus to photograph the mountain from a distance of about forty miles. The stop used was ¼ inch; exposure 30 seconds, at 3.30 P.M. the early part of October; plate, Inst. Iso. Immediately afterward I exposed a Slow Iso. plate giving five minutes' exposure; the results were about the same, the slow plate making the better negative.

At Close Approach

"From close approaches the camerist finds a wealth of possibilities in picturing the mountain and surrounding objects by instantaneous exposures, without ray-filter or tripod, but I would recommend the use of a tripod for timing and accurate composition, and a pale filter to save the delicate contrasts in the glacier-coloring, whereas time can be given to bring out the lightings of the foreground.

"Overtiming is not generally to be feared in mountainous landscape-work, as is supposed; most beginners undertime their pictures. In landscape hand-camera work where there are no moving objects to consider, a shutter need not be set faster than to obviate the unsteadiness of the hand, say at 1-15 second.

"The vacationist, who makes pictures incidental to the outing and does not wish to be encumbered by weight, will find a 4 x 5 the best average shape and size, together with a lens of ordinary angle and about 6-inch focus. The use of films on a trip up the mountain is

advantageous, owing to their light weight in proportion to the number of exposures and their daylight-loading quality.

"In picturing the mountain from near positions, where an immediate foreground of green slopes and trees comes into range, in full sunlight during mid-afternoon in summer, a good average exposure would be two seconds at *f*/16, with a medium filter and an Inst. Iso. or yellow-sensitive orthochromatic plate. This exposure would be incorrect when working on the glaciers. Above all, green tints, where the coloring is all-actinic, lessen the exposure to one-third, and on the mountain-summit, above the denser air and moisture, where light is clear from every direction, one-fourth of the time will be sufficient for snappy, clear results. With stop *f*/64 and a medium filter, I have had good results with one second exposure in picturing the upper glaciers on filmpacks.

"In making pictures of the formations of the glaciers at close range, it is possible to get good results instantaneously with a pale filter, using the larger stops and not exceeding 1-25 second exposure. Also, good pictures where glacier contrasts provide them, can be made instantaneously with the small stops without a filter.

"A developer that has been used some and kept a day or two is excellent to retain the highly actinic detail, and to produce the cleanest possible negatives. It is well to make duplicate exposures of important subjects so as to obtain negatives differing in the scale of gradation. . . . During picture-taking weather the air is generally tranquil enough around the base of the mountain to permit work with a tripod without stay or braces. In making a tour to the summit I would recommend that the tripod be omitted for the sake of lightness, carrying the camera in a case fastened to the belt around the waist, thus leaving the arms free. No better place can be found for hand-camera work than this upper world of light.

Development

"A good and simple developer for films or plates, full exposures, or even overexposures, is made up as follows: Water, 16 ounces; eikonogen, ⅛ ounce; hydro-

quinone, 30 grains; sodium sulphite, dry, 100 grains; sodium carbonate, dry, $\frac{3}{16}$ ounce; potassium iodide, 16 grains.

"Development and fixation will take more time than with ordinary developers, but if solutions are kept in motion during development and fixation, clean negatives of good printing-color will result. Exposures developed in this appear dim and foggy upon examination during development, but give them plenty of development, and it will be seen that there is no fog when fixation is complete."

Making an End

Here we must make an end of our journeys with the camera away from home. The field, as was said in the beginning, is illimitable, and we could easily fill a hundred pocket-books like this with the experiences of those who have carried the camera to the four corners of the world. But space forbids, and we must content ourselves if we have covered the essentials which will help us to get the most out of our trip, which I think has been done as far as space permitted.

Emphasize Preparation

Two points deserve emphasis in conclusion. They touch upon the beginning and general success of the journey, and upon its ending and the success of its ending, hence their importance. The first is that the more careful the preparation made for travel with the camera, the more certain will be your success as far as your camera work is concerned. You will find subjects everywhere, at every turn of the road, and each subject will present its own problems. These problems, comprised in the broad phrase, handling the subject, can be solved without any difficulty if you have in part prepared for them beforehand. This subject may need a wide-angle lens and that a lens of fairly long local length, or even a telephoto attachment for its proper presentation. So, this subject or scene may call for the use of a color screen, and will be flat and uninteresting if photographed without a color screen. For this view a tripod may mean all the difference between success and failure; for another subject a fast shutter, with speeds up to 1-300 of a second, may be essential to catch the move-

ment in the scene. A lens shade may mean better pictures all the way through, and so on indefinitely. All these details should have consideration, directly connected with your knowledge of the itinerary of your proposed trip, before you leave home.

Knowledge Means Success

The same need of forethought applies, perhaps more urgently, to familiarity with your equipment and its use. Skill in the quick adjustment of the camera, in the use of the finder, in your correct estimation of distances and the use of the focusing scale, in your practical knowledge of the factors of exposure, and especially in your skill in holding the camera, so as to be able to give exposures of 1-15 or 1-10 of a second without a tripod, i. e. with the camera in the hand, steadied under one arm or against the body, or supported on a fence or wall or against a post or tree. These are the little points on which successful pictures depend, and your mastery of them all must be fairly complete before leaving home.

The excitements of your journey, the strangeness of your surroundings and of new conditions, the interferences of one sort or another which are bound to be encountered when traveling away from home, will naturally occupy your attention and lessen your chances of success with the camera unless you are familiar with its handling.

Profit by Experience

A careful reading of the preceding pages, and of the other handbooks mentioned, will help you immensely in this necessary preliminary study of your holiday. In these few pages, the experience of at least a score of travelers, expert in travel and in the use of the camera, has been carefully gleaned and compressed for your practical help. The obvious things, such as the wisdom of taking along a changing-bag if you are to use plates; the avoidance of impossible subjects; means of extemporizing darkrooms for developing en route, and so on, have been left out as unnecessary. Elaborate directions as to the transportation of photographic material and apparatus in foreign countries, photographic labels for getting cameras and films through foreign custom

houses, and the like, are not necessary at present, since few if any tourists will attempt to take cameras on pleasure tours in Europe, Asia or Africa for a year or two at least. But whatever will help the amateur in America, or Britain, or Australasia, to get a bigger than usual percentage of holiday pictures for this and next year's holiday has been covered as fully as seemed necessary for the purpose.

Developing Travel Pictures

The subject of developing the exposures made on a trip away from home needs to be mentioned. It is customary, in handbooks of this sort, to discuss more or less fully the methods of developing films or plates en route, and even to talk of the making of prints away from home. But in these days of films and plates with known "keeping quality," it is better, in the writer's opinion, either to mail one's films home for development, or to keep them safely packed until they can be developed and printed from on the return home, with the care and attention they need. Of course, where the reader is already accustomed to rely upon the service of a local dealer for the development of his films, his travel exposures will be mailed to that dealer at convenient intervals during the trip. Those who have never known the convenience of such a service, where really reliable, may be be advised to send their films to Miles Greenwood, Melrose, Mass., whose careful work for the writer during some years past merits this word of personal recommendation.

Two Methods

For those who want to test their exposures on the journey by an occasional development, two ways suggest themselves. First, the use of the darkroom of a local photographer, or photo supply house, or camera club, wherever they may find themselves at the moment. Second, the use of the film tank (for roll or film pack exposures) or the plate tank for plates. This last necessitates the carrying of a tank with one's baggage, and the providing of some "safelight" or darkroom for loading and unloading plates where these are to be changed or developed. But the tanks of today and their practical use offer no difficulties and call for

no special instruction, when once the reader has determined to put up with the necessary bulk and the little extra trouble involved in carrying them about. This applies, also, to the making of prints en route. I cannot imagine even the most enthusiastic traveler going to all the bother of making development prints on his trip, hence my advice here will be confined to the carrying of a few packets of any reliable self-toning paper and a pound of hypo. With these, and negatives developed on the way, a spare hour or two will furnish such prints as the traveler may desire to send to friends as souvenirs of his journey. But I imagine that the service of the local dealers encountered in most towns on the journey will be preferred by the average tourist to the spending of his all too brief holiday time in developing and printing en route.

Turning the Trip to Profit

A last word must be given to the profitable possibilities of a camera-trip away from home. There is a growing and profitable market for photographs useful for the illustration of newspapers, magazines and every sort of printed material such as calendars, pictorial subjects, books and the like. A trip abroad with the camera offers many opportunities of securing photographs which can later be sold to publishers seeking pictorial or illustrative material. This field is by no means so widely appreciated by amateurs (or professional photographers, either, for that matter) as it might be. Sometimes a single print can be sold for $25 to $50 to a publisher seeking just what that print offers. An average price for prints used in magazines is $3. A group of half a dozen selected subjects for a page in one of the picture sections of a Sunday paper will generally realize $50, and so on. This market for photographs is fully discussed, with lists of publications buying prints, in THE PHOTO-MINIATURE No. 120. My desire here is simply to call the attention of the photographic traveler to the field and its possibilities as a means of making his picture-making profitable.

Apart from the selling of travel pictures, by which, of course, I mean every sort of subject met with by the amateur who takes a camera with him when away from

home, there are endless possibilities of pleasure and profit on the return from the holiday, in utilizing one's negatives, for the making of lantern-slide sets for illustrated lectures, and the production of enlargements of selected subjects for home decoration, gifts to friends, or in the making up of travel albums for sale to one's fellow travelers. I recall an instance where an amateur covered all the expenses of a European tour by following up this last suggestion.

Notes and Comment

The Edinburgh (Scotland) Photographic Society is proceeding apace with its photographic survey of that ancient city, and has already handed over to the City Museum a portfolio containing five hundred photographs of buildings and places of interest in one of the city's wards. The photographic survey idea is one which deserves to be more widely followed by our American societies.

The May issue of *The Photographic Journal*, which publishes the transactions of The Royal Photographic Society of Great Britain, contains a lengthy paper of unusual interest, dealing with "Thio-Indoxyl Development and Its Bearing on the Theory of the Latent Image," by Raymond E. Crowther. In this latest contribution to the somewhat scanty literature of the latent image, Mr. Crowther advances the idea that "the cause of the latent image formed by the action of light is in the beginning electrical, and to be explained on the assumption that on exposure the silver bromide is disturbed in its slumbers and shoots off electrons." Another interesting paper in this issue of the *Journal* is that dealing with "Some New Telephotographic Appliances," by the veteran telephotographer, Captain Owen Wheeler.

Ansco Company, Binghamton, N. Y., send me copies of the new editions of their "Ansco Film" and "Cyko" handbooks, each offering 64 pages crowded with useful information concerning the successful use of these famous products. Another attractive Ansco publication is a brochure entitled "Who Won," reproducing

the winning pictures of the recent Ansco Loveliest Women Competition, with a list of all the prize-winners. Copies of any or all of these can be had on application to Ansco dealers, or direct from the company on postal request.

Mr. Alfred J. Newton, concerning whom a note appeared in our last issue, has returned to this country, bringing with him Mrs. Newton and Miss Sylvia Newton. Mr. Newton will hereafter be located at Rochester, N. Y., taking a place in the wonderful photographic organization generally spoken of as "The E. K. Co."

The 1915 Ingento Book has just been published by Burke & James, Inc., Chicago. It describes and illustrates the complete line of Ingento hand-cameras and amateur specialities of this house. Better send for a copy.

As the war is prolonged, and it becomes increasingly difficult to obtain supplies from "the other side," the shortage of German and British cameras and specialties is likely to become acute. Already two or three prominent importers are complaining of their inability to fill orders. G. Gennert, New York, agent for the well-known Ensign hand-cameras and Ensign films, advises me that he has an abundant stock of these on hand, in all sizes and varieties, embracing over a hundred different models. Send for the 1915 Ensign list. You will enjoy its many-sided interest.

More than fifty per cent of the sales of The Photo-Miniature during the month of May included P-M No. 120, "Marketing Photographs for Publication." It looks as if the American amateur were awakening to the fact that there is money in the camera for those who know how to go about it in the right way.

Ever so many years ago, Frank V. Chambers, of Philadelphia, known to all the world now as the editor of *The Camera* and *The Bulletin of Photography*, sat in a Philadelphia law office and "stewed" over "Chitty on Contracts" and "Chitty on Pleading at the Common Law." These legal beginnings have come to fruit in a new "Legal Department" in *The Bulletin of Photography*, conducted by Elton J. Buckley, Esq., who gives us an interesting paper on "The Statute of Frauds and Perjuries." Subscribers to *The Bulletin* ($1.75 yearly) are advised that Mr. Buckley will answer their legal difficulties free of charge, as part of the work of the "Legal Department."

In writing the preceding note, I am reminded that for a long time past "*Abel's Photographic Weekly*" has published a weekly sermon—130 sermons in all—while "*Platinum Print*" is given to publishing poems.

Readers who are seeking a reliable exposure shutter, which gives accurate variations in its different indicated speeds, should write to the Ilex Optical Co., 600 Ilex Circle, Rochester, N. Y., for a copy of the Ilex Green Book. Ilex shutters are built on a new principle which assures many practical advantages in use, apart from the vital advantage of accurate speeds. They are worth looking into, and the prices are remarkably moderate.

The many friends of Mr. Walter Burke, F. R. P. S., will be interested to know that the January issue of his "Australasian Photo-Review" was a purely Australasian number, with every article in it specially written and illustrated by Australasian workers. It contained, among many good things, an article on "Alpine Photography" (illustrated), by the editor; another on "Photographing the Kiddies," with dozens of laughable snapshots of children; a humorously illustrated paper by Harry Julius on "The Camera Cannot Lie?," etc. In interest and practical value, as well as in general

appearance, this number was fully equal to our own American journals, and Mr. Burke deserves great praise for the showing. (Kodak Ltd., Australasia, Sidney, Melbourne, Brisbane, etc. $1.50 per year, post free.)

R. J. Fitzsimons, Sole U. S. Agent for the Lumiere-Jougla products, advises me that he has secured the American agency for the Verascope Richard, the Richard Glyphoscopes and Taxiphotes. It would take pages to describe these clever little French cameras in detail. Let it suffice to say that the Verascope Richard is generally admitted to be the world's premier stereoscopic hand-camera, and that Mr. Fitzsimmons will gladly send descriptive leaflets to anyone requesting copies.

Readers who will invest in a post card and address it to W. J. Lafbury Co., 305 North 5th Ave., Chicago, mentioning this note, can secure a handy exposure chart for use with rapid lenses and shutters, in photographing subjects including movement. Ask also for the new bulletins of information *in re* Rodenstock anastigmats.

The current number of the "British Journal of Photography" contains a lengthy editorial note praising the practical virtues of THE PHOTO-MINIATURE No. 136: "Posing the Figure in Portraiture," which I, rejoice to see, as bringing the little book to the notice of those for whose helping it was made. I note with pleasure, also, that the publishers of the "B. J.", Messrs. Henry Greenwood & Co., London, have undertaken the sale of this particular number of THE PHOTO-MINIATURE which is bound to help toward its wider distribution.

To the marvels of photography must now be added portraits made with the tiny natural lenses which are

to be found on the upper surface of the leaves of plants. The thing sounds incredible, but I speak on the authority of a note in the "British Journal of Photography," which says that such portraits were shown at the Royal Institution (London) by Prof. H. V. Blackman a few weeks ago. "The object of these tiny lenses" says the note, "was, in the opinion of botanists, to focus the light on to the cells beneath, this explaining the fact that plants always turn to the light."

The New York newspapers of June 18, contained an interesting report, by S. H. Horgan, the well-known authority on process engraving, dealing with the recent work with the new Kodachrome process done by Dr. Nathan T. Beers, of Brooklyn, N. Y. Dr. Beers has had remarkable success with this color method, in portraiture as well as in his special field of medical and surgical photography.

I wish that I could persuade every reader of The Photo-Miniature to investigate the claims of Satista, the silver-platinum print paper recently introduced by Willis & Clements, Philadelphia, Pa. It gives permanent prints of rare beauty, closely rivaling platinotypes, but yielding brown or black tones. It is very simple in manipulation, prints five times more quickly than print-out paper, and is inexpensive.

The School of Photography, conducted by Mr. Clarence H. White, of New York, will open its sixth annual summer session at Seguinland (P. O. Five Islands, Maine), July 5, next, the course covering almost six weeks, until August 14, Those who seek a delightful holiday on the Maine coast, combining the best of photographic training with vacation pleasures, should arrange to join Mr. White's party without delay.

An October Morning
J. F. Wilde

A Country Boat on Lake Maggiore
J. Dudley Johnston

St. Luke's Summer—The Tate Gallery, London
Basil Schön

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

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Modern Methods of Development

After exposure, the development of the negative is the one photographic process about which we cannot know too much. I say this now with just as much emphasis as I said it in 1902, in presenting the monograph "More About Development," published as Number 34 of this Series. If anything, the statement has a larger significance today than it had then, for since that time many of our photographic "authorities" have labored long and persistently to establish the view that the development of the negative is little more than an automatic operation. They tell us that, given correct exposure, development may be reduced to two simple adjustments, viz: the temperature of the developing solution, and the time the plate or film stays in the developing solution. I have no quarrel with the various methods evolved to fit this most comfortable doctrine for daily use. 'Twere a consummation devoutly to be wished! And, used in strict conformity with the terms in which it is expressed, it is, for certain classes of workers, a practical and serviceable doctrine. The trouble is that the majority of those who are interested in development take the statement "bodaciously," as the colored minister expressed it, that is, wholly without qualification, as applicable to all development. But, as the discerning will note, the statement of the doctrine is qualified by

an "if," an all-important condition, to wit: "Given correct exposure." So that, even if we accept the modern theory that development may be largely automatic in operation when we deal with correct exposures, it is still most true that we need to know all that may be learned of the how and why of development, in order to get the best possible results from such of our exposures as are not correct, or about which we are in reasonable doubt.

Correct Exposure

Think, for a moment, of how rarely the average worker can assure himself of the correctness of his exposures. Even when the best of exposure meters, used with the utmost carefulness, has given us all the helps it can, there remain many factors which have to be dealt with according to the personal judgment or experience of the photographer. The beginner has only to spend a few hours in the darkroom of an old hand to see how far developing is from being an automatic process. He will find that it is not so much the formula as the way it is adapted which counts—"the man behind"—as in so many photographic operations. These developing methods are the province of the present monograph, the purpose of which is to bring together, ready for use, the experience gained by practical photographers during the past few years. Of late, few new developing substances have been issued from the chemical factories, but very real progress has been made in many directions as to their use and the avoidance of the misuse of familiar developers: all of which, as here made accessible to the man who wants the facts to hand, should help in further advancing the art of making good negatives.

First: Safe Working Light

It won't do to ignore the proper provision of the light by which our developing work is done,—and by "proper" I mean a light which is both sufficient and safe. Here, as in many matters of this hard world, we have to be content with a compromise. Since dry-plates are what they are, the safety of the light in which we handle them is a quality opposed to brightness and comfort (to the eyes) in the darkroom. You can't

have more of one without sacrificing something of the other. But every photographer recognizes that the light must not fog the plates, and therefore is apt to go to the other extreme, namely, to use a light in which he can't properly see what he is doing. Therefore let me point out several ways in which comfort can be increased without imparing safety.

Safety and Comfort

First, the light of the darkroom lamp should be diffused. Never use a clear sheet of ruby glass which lets you see the lamp behind it. The eye is thereby kept perpetually dazzled, somewhat as it is in strong daylight. In a diffused light the iris opens, and you can see things better. If your safelight is otherwise satisfactory, bind it up with a piece of clear glass, the same size, placing one or more sheets of white tissue paper in between. Secondly, have the safelight fairly ample in size—not smaller than 8 x 10 inches, all the better if larger—and don't fix it right facing you as you stand or sit at work. It should be several feet to the right, and ought to be fitted with a shade, which cuts it pretty well out of your view, but lights the surface of the working-bench. The shade should be capable of being raised when you want to hold the negative up to the light.

The Best Light

An ideal arrangement, easily fitted up with electric current, is to have two lamps, one to the left, hanging several feet above the bench and casting the light straight down; the other, to the right, placed vertically, and a partition between the two sections of the bench. Plates are loaded into dishes, tanks or trays on the left, and examined, when need be, on the right. This enables one to use a weak light in the first stages of development and yet to judge properly what the negative is like before fixing it. Then arrange for plates to be quickly sheltered from the light by a card over the dish, or by a shelf under which the dish can be slid. Particularly in the case of orthochromatic plates, the veiling or fogging of the negative is a matter of time of exposure even to a "safe" light. The maker uses a portion of the permissible time in coating and packing the plates. By unnecessarily exposing the plate during develop-

ment one can overstep the limit beyond which fog is caused over all the plate. You may recognize it by the veiling over what should be the clear margins protected by the rabbet of the dark slide or holder.

Modern Safelight

As regards the safelights themselves, an immensive improvement has been made by makers within the past few years in working out filters of dyed gelatine or collodion, to replace the flashed or pot-metal orange and ruby glasses of olden time. A safelight of this kind, prepared by scientific measurement, is positively much "safer" for the light it gives than those of glass, many of which allowed plenty of blue light to pass. With ordinary (non-ortho) plates of "ordinary" or medium speed, one can now work in a fairly bright orange light; with ultra-rapid plates in red, and with orthochromatic plates in deep red. For panchromatic plates even, it is possible to get a green safelight which yields a reasonably safe but dim illumination. I am surprised that more use is not made of a green safelight for ordinary and orthochromatic plates. Within the first minute or so, the light seems poorer than red, but after that it is astonishing how well one can see. For long spells in the darkroom a green safelight is usually found much better than red and quite as safe.

Making up Developers

I am taking it for granted that the reader will make up most of his developing solutions himself. Not that I wish to disparage the many excellent developing preparations on the market. They are all good of their kind, but here we are rather interested in knowing what chemicals a developing solution contains, and how its various constituents are proportioned; which can best be learned by making the solutions for oneself. Apart from the vital fact that the home-made developer is quite as efficient as, and more certain or more reliable in results than, the average commercial ready-made developer, it deserves consideration because of its very practical economy. Of course, it is the difference in results which should principally move the reader to do his own developing; but the big difference in expense should be as powerful a factor in urging him to prepare

his own developing solutions, rather than to depend on others for them.

Developing Agents The preparation of a developer is a much simpler matter today than most of the textbooks would lead the reader to suppose. We need a developing agent as the active base of the developing solution. Such agents are ferrous-oxalate, pyro, metol, hydroquinone, adurol, eikonogen, ortol, glycin, amidol, duratol and rodinal. The behavior of these, if one may so speak, differs in practice; some are said to be rapid and others slow; some are said to give more detail than others, and so on. But, as Watkins points out after exhaustive tests, these differences are more apparent than real, and depend upon variations in use rather than on actual facts. As a general rule, it may be stated that they will all give identical results if the plate is taken out of the developer at the same stage of development. So that, as a practical conclusion, it matters little, if at all, which of them the reader employs, except as suiting his personal opinion and convenience. Ferrous-oxalate, however, demands about twice the normal exposure required for the other (organic) developing agents.

Preservative Some of these developing agents need the addition of a preservative to keep their developing power, or efficiency, or clearness, when in solution. Soda sulphite is almost invariably employed for this purpose, a notable exception being pyro, with which an acid salt, such as potassium metabisulphite is used. An acid sulphite, viz: a mixture of acetone and sulphite, has also been recommended with pyro.

Alkalies With all the agents, except rodinal, an alkali is used as an accelerator, i. e., an energizer which sets the active developing agent in motion and speeds its work. Soda carbonate is the alkali most commonly used, although potassium carbonate is often recommended. The hydrates of these, usually spoken of as caustic alkalies, are rarely called for and should be avoided wherever possible, their action on the skin provoking irritation unless care is used.

Restrainer With some of the modern developers, and for certain conditions, what is known as a restrainer is employed, usually in very sparing proportions, viz: a few drops of a dilute solution (10 per cent) of potassium bromide, or a few grains of the salt. The action of the restrainer is said to be that it retards the work of the alkali and thus enables one to get more density without fog, or it keeps the plate clear from fog, and so on. About which much ink has been spilt.

Having chosen the developing agent and laid in a supply of the two or three other chemicals needed, and with a means of weighing and measuring at hand, the reader will find no difficulty in making up any of the developer formulas recommended.

Dry Sodas In the first place, the dry or anhydrous form of soda sulphite or soda carbonate is a very positive facility, as compared with the crystallized variety of these substances which was the only form until a year or two ago. It is true that both sulphite and carbonate of soda are easily soluble bodies; but, even so, if you have to dissolve a pound or two or, for that matter, only a few ounces, it makes all the difference if they dissolve almost as quickly as you can stir them into the water. These dry sodas have been deprived of their "water of crystallization," and so dissolve in water with much greater avidity. Moreover, weight for weight, they are "stronger" than the crystal sodas; a much smaller quantity serves the purpose, according to a simple rule which enables one readily to know how much dry sulphite or carbonate to use when "cryst" is directed in a formula. In place of "cryst" sulphite, use just half the prescribed weight of "dry;" in place of "cryst" soda carbonate, use two-fifths the quantity of "dry:" e. g., 2 ounces "dry" instead of 5 ounces "cryst" carbonate.

Dissolving Dry Sodas When making a solution of these dry sodas, don't pour water over the weighed quantity but drop the latter—not all at once—into the water and at once stir. The water then comes freely in contact with the soda, which quickly dissolves; but, if the water is poured over it and

there left, the soda cakes into a hard crystalline mass which dissolves much more slowly. With anhydrous soda, there is no need to use hot water to aid solution, but there is no harm in having the water comfortably warm, say 90 to 100 degrees F.

Water for Developers

This brings me to another point in making up developing solutions. If distilled water is available, it is certainly best to use it but it is by no means necessary to have it. It is the best for the purpose for the reason that it is free from mineral substances or organic impurities, and so forms a clear bright solution. If freshly distilled, it is free from air, with the result that the developer proper and also the sulphite keeps better when dissolved in it. But a little cloudiness or even "some" deposit in a developer is of no particular moment. The chief thing is to have the water with as little air as possible dissolved in it, and that can be done just as well by bringing the water to the boil and then letting it boil briskly for five minutes. Boil it for this time in a clean open kettle or saucepan, then pour it quickly into a jug and leave it undisturbed to cool. If you are in a hurry, place the jug in a basin of cold water, but don't stir or shake up the boiled water. To do so charges it again with air. It will not take long to cool to about 100° F. which, as we have seen, is a convenient temperature for general use.

Keeping Developers in Solution

Although all kinds of strange devices have been advertised for preserving the stock developing solution in good condition, there is nothing simpler and more effective than placing it in a lot of small bottles, filling each to the neck and corking so that no air remains above the liquid. By "small," I mean a bottle holding enough for only a week or two's use. According to the amount of work you do, it may be 2, 4, or 40 ounces. The object is to save the bulk of the solution from the deterioration which results from the constant opening of the bottle—the shaking of the contents with air,—which is what happens when a fair quantity of solution is kept in one large bottle. I am speaking now of one-solution developers, or of the solutions containing the developer

proper. The No. 2 or B solution of most developer formulas as a rule contains chiefly carbonate of soda, which keeps almost indefinitely. If it contains caustic soda, which deteriorates in use, it is well to bottle it also in a lot of small portions. Dr. Baekelandt, some years ago, made some tests of the keeping qualities of a single-solution metol-hydroquinone developer stored in this way, and found that it retained its full power for over eighteen months. I don't suppose anyone wants to keep developer longer than that.

Development Manipulation

If I were writing a textbook on the lines laid down by the ancient authorities, I should now proceed to describe the many developers, and give the formulas for compounding them. But this monograph aims at telling things which authorities in their wisdom say nothing about. Of formulas you can pick and choose from "Figures, Facts and Formulæ" (THE PHOTO-MINIATURE, No. 134), or the plate- and film-makers' handbooks and, broadly speaking, one will do as well as another if you know how to use it and which developer to choose. Here I am concerned chiefly with methods and use, and especially with the simple hand operations in the development of plates and films.

Pouring on Developer

You can tell the unskilled worker by the way he (or she) pours the developer over the plate. Often, anyhow, often right on the middle of the plate, whence it is wriggled over the whole surface with some difficulty. The old hand sweeps the developer on with one even flood by drawing the graduate along one side of the dish, at the same time pouring the contents onto the plate and (with the other hand) slightly raising the side of the dish on which the graduate rests. The largest plate is quickly and evenly flooded by this movement, and that with the minimum quantity of developer.

Putting Plate into Developer

Some learned writers will tell you never to put the plate *into* the developer but always the developer onto the plate. Why, I don't know, because it is the easy and natural thing to do when developing several plates in succession. With one hand lift up one end of

the dish so that the solution collects at the other. Then insert one end of the plate in the solution, and at the same moment let the dish fall sharply into the level position. The developer then runs in an even wave over the exposed film.

Several Plates in One Tray

I deal later on with the time-saving and labor-saving tank for development, but for small sizes of plates, up to 5 x 7 inches, a large dish serves almost as well as a tank when dealing with a small batch of plates. Hollinger has used this method for years, generally developing twelve plates in a tray. In some respects it is better to have all the plates under inspection, but it is necessary to prevent them from slipping over each other. One simple means of doing this is the so-called "plate-separator," consisting of a small vulcanite square with four upright pieces fixed to it. This serves to keep four plates apart. A separator with only one upright piece across it suffices when developing two plates in a dish which accommodates them. These fitments are obtainable commercially in Britain, but it is not a difficult thing to make a separator by cutting a sheet of stiff celluloid the size of the bottom of the dish and forming a few short uprights in it, softening the celluloid in hot water for this purpose. If a stiff, rigid tray is used and the plates carefully placed therein, they will hold together without sliding during development.

Swab the Plate

Another thing which the beginner omits, but the old hand scarcely ever, is to rub over the surface of the plate, immediately it is in the developer, with a pledget of clean cotton or a soft, gritless Turkey sponge. Either is passed quite firmly all over the plate and dislodges air-bells adhering to the gelative surface. Depending on the degree of aëration of the developing solution, air-bells can prove a nuisance in development. They delay the action of the developer for a time at various minute points, and give rise to light spots in the negative. The round shape (with the clearest part in the middle) of each spot, when seen under a magnifier, shows that it is caused by air-bells. A spot caused by

dust or dirt in the plate before or after exposure may be of any shape and under a magnifier is seen to be of the same clearness all over.

Systems of Development

Broadly, we can classify methods of development as follows: (1) Inspection, i. e., watching the plate or film as it develops, and judging completion of development by the appearance of the negative; the universal and only system until some twenty years ago. Plates may be handled in trays or tanks. (2) Stand development, that is, use of a very weak developer for a long time, 2 to 12 hours. Never much used. (3) Tank and time development, viz: the use of a developing solution for a certain time, found by preliminary tests for the particular formula, plate or film, and temperature. All three require to be the same as in the test, for, as largely practised, particularly with film, the negative is fixed without looking at it. (4) Factorial development (Watkins). A system of judging the total time of development by noticing how long the first details take to come out. Less restrictive of the use of various plates and developers than "time development." This method has latterly been perfected by the addition of various factors and development-speeds, the improved method being known as "Thermo Development." In addition to these, there are other working methods of much practical value, but hardly deserving the name of "systems." I will deal with them in their place.

Inspection or Tentative Development

Given a suitable developing formula and a good plate or film (it can be said there are no bad ones nowadays), development is largely the problem of when to stop the action of the solution. In deciding that, we have to consider the degree of exposure of the plate, the subject, and the intended use of the negative (printing process). This is a short enough statement of what development is, but it sums up the experience which photographers spend years in acquiring, without feeling, even then, that their skill can secure in the finished negative all that lies latent in the exposed plate. Perhaps we may best begin with the development of a correct exposure.

Exposure for a Developer

Is there an exposure of the plate which is correct for one developer, but too much or too little for another? Or, in other words, do we need to expose with regard to the fact that formula A is to be used for the development of the plate, and not formula B? There is much debate on this question. We all know the worker who claims to get with his pet formula what he cannot get with any other. I think the differences among developers as regards their "power" greatly exaggerated, taking power to mean the rendering of detail in the least exposed parts. Undoubtedly, ferrous oxalate developer is one by itself, and calls for about double the exposure of the plate required when organic developers are used. But with normal formulas for other developers from pyro to the latest "ol" or "al" of the chemist, the difference lies broadly in the time taken to secure contrast, in freedom from stain, in amenability to the use of bromide restrainer, rather than in the detail which can be got out of a minimum-exposed plate. In proof whereof, do we not find an expert like Dr. Adolphe Abrahams using pyro-soda as the best developer for his high-speed photographs of 1-2000 second exposure, and less? I don't wish to disparage developers which are more suited to under-exposure or over-exposure, because it is easier to use them wrongly under these conditions. Of them more as we proceed. Here let me emphasize: Know your developer and stick to it.

Developing Normal Exposures

We can't define an absolutely correct exposure. We know under-exposure by the lagging of the dark parts of the subject. It is less easy to say that a plate is over-exposed from its appearance in the first half-minute or so in the developer. With some developers, such as rodinal or metol, all parts come up together, much as an over-exposed plate would with normal pyro-soda or hydroquinone. The difference comes out as development goes on. And, though it is not possible to say precisely the point at which over-exposure or under-exposure has ceased to show itself, we do know the correctly exposed plate as one which steadily develops without fogging and without needing to be "forced."

When to Stop Development

As it develops, we see that the band at the edge of the plate where it is protected by the rebate of the plate-holder remains white. If it doesn't, it is a sign of a fogging developer, or of a plate which fogs without exposure to light; or of both things together. With the best plate and the best developer there will be a *little* darkening, but it should be very little. For the moment, we won't trouble about the appearance of the negative at the early stage—whether detail all over or only in the more-exposed parts. In the latter stage, this difference is much less marked. The plate, as it lies in the dish, is gradually showing detail everywhere, and at the same time contrast between lightest and darkest parts, i. e., the shadows and lights in the negative. Now hold it up to the darkroom lamp. The detail will look about the same, but the contrast less. Now we are at the difficult stage; difficult because we have first to guess the extent to which the apparent contrast will fall away on fixing. With pyro-soda or pyro-metol, this falling away of density is very little; with metol-hydroquinone and hydroquinone it is a little greater; with rodinal, metol, and such developers which bring all parts of the picture out together at first, it is considerable, so considerable that if you don't allow for it, and develop further, you will be disappointed at the flatness of the negative. Also it varies with the plate. Broadly, a slow or medium-speed plate shows less falling-off than one of high speed. Some of the ultra-sensitive plates will be found to have the awkward habit of gaining density up to a certain point—at which they look quite a little short of "done"—and then appearing not to gain further. On fixing, they are either too thin or too dense, according as one has gone on for too short or too long a time. For these plates, the "time" method is a good one; but, if you don't care to put your faith altogether in "time," you may take some aid from it by making a test or two, to find how long the plate must be further developed after the stage of medium density has been reached. It hardly needs to be said, in passing, that for the expert worker, whose exposures are generally

correct, and who prefers negatives of even density and color as best suited to the printing paper most generally used, the "time and temperature" method of development suggests itself as the simplest and best solution of his development problems.

Under-Exposure

The bad effect of under-exposure, viz., a hard "chalky" negative, is aggravated by the treatment which so many under-exposures receive, i. e., over-development. One develops for too long in the hope of "forcing out" detail. The result is to produce such a heavy deposit in the high-lights of the plate that any little extracted detail remains unprintable. It is better, if you are using a developer of normal strength, to stop when the high-light density is enough. Better still, to put the plate then into plain clean water. Fifteen or twenty minutes will often bring out detail, and there is no chance of the contrast becoming too great. In fact, it is as well, if a plate turns out to be under-exposed in the normal developer, to put it in plain water for a while as soon as the high-lights are fairly well out. Meanwhile the working developer can be mixed with four or five times its bulk of warm water, so as to give a solution of temperature from 70° to 80°. Many plates will stand the latter temperature without harm; or, before placing back in the warm solution, the plate may be given a bath of formalin (1 part) water (20 parts) for ten minutes with a rinse after it. For making the best of under-exposures in this way some workers prefer metol or amidol developer, but I don't think you can do better than pyro-soda. Used weak, it will not put on density very readily, which is the thing to avoid. If the negative is too weak, the best intensifier is the uranium or mercuric iodide (Lumiere) single solution—not mercury and ammonia, which increases contrast.

Over-Exposures

With these, the general temptation is just the opposite, viz: under-development. The over-exposed plate comes up quickly all over, is of flat appearance, and in a little while has the look of becoming hopelessly buried in dark fog. Therefore it is often fixed at this stage with a result which is wretchedly flat, yet with-

out enough "body" in it to give one a chance of clearing it up with a reducer. Not so, if one develops farther, neglecting the fogging action. In fact, up to a reasonable degree of over-exposure, the more the plate fogs over the longer it needs to be developed. The resulting negative may be of terrific density, though of just passable contrast. Farmer's reducer of hypo and ferricyanide will both brighten the contrast and reduce the depth. Often it will clear off fog (which is largely on the surface) to an extent which leaves the highlights fairly clear—i. e., clear enough for the negative to benefit by intensification.

What I have just said applies to a plate which is not known or suspected of being over-exposed until its behavior in the developer is seen; one, too, which has not been grossly over-exposed. If greatly over-exposed (say, eight to twenty times), mere longer development will usually not be enough to save it.

Gross Over-Exposure

To do any good with such over-exposure you need to take measures at the start. Often the first plate of a batch supplies the warning that others have been badly over-exposed, then a developer dosed with bromide can be made up from them. Bromide will not make perfectly good the error of exposure, but it will effect an amazing difference as regards vigor and contrast. The amount to be added is largely a matter of guesswork, but some rough standards are of service. With pyro use from 3 to 8 grains potass bromide per ounce of working developer; i. e., 30 to 80 minims of 10 per cent solution. Bromide has a more powerful effect with pyro than with other developers, and the pyro itself is a restrainer if used in increased quantity up to, say, 4 to 6 grains per ounce. Metol-hydroquinone is a developer which can do with somewhat more bromide, whilst developers like metol, amidol and rodinal require still more to produce the same degree of restraining action. In dealing with anticipated over-exposure, it is better to make up the developer with too much than too little bromide. If the image then does not come up readily, rinse off the developer under the tap or in a dish of water, and start again with a developing solu-

tion containing less bromide. In any event, don't stop development because the surface of the plate darkens over. Go by the vigor of what image you can see with the negative held up to the light. If it looks flat, steel yourself to give it another five, ten or fifteen minutes (as you judge necessary) whatever happens to it, and, when it is fixed, consider if a treatment of Farmer's reducer will improve it.

Citrate Restrainer

In place of bromide, a very effective restrainer is a 10 per cent solution of ammonium citrate. It works particularly well with the pyro-ammonia developer, now discarded by most amateur workers, but still the standby of a few professional photographers. To make the solution, dissolve 1 ounce of citric acid in about 5 ounces of water, and add strong ammonia (about 250 to 300 minims) until the mixture just turns a strip of red litmus paper blue. Then make up the 10 ounces with water. From 1 to 1½ drams of this solution per ounce of developer is added, as soon as the detail of the image is shown on the plate. The developer will then go on producing density, whilst the citrate greatly counteracts fogging of the emulsion as a whole. It is a restrainer which requires some experience in selecting the right stage at which to add it, but it is capable of making an immense improvement in a badly over-exposed plate.

Other Remedies for Over-Exposure

Just as warmed developer improves matters for under-exposure, so it is possible—with some developers—to control over-exposures by cooling the developer. The quick-appearance developers such as rodinal and metol are of very little use in this way. Hydroquinone is much restrained by reduced temperature, becoming, in fact, almost inert much below 50°F. Pyro-soda is, on the whole, the developer which is mostly usefully controlled by this means. Ice-water, used for mixing with the stock solutions to form the normal working developer, will easily allow of a temperature of 40°F., which makes a great difference in reducing the energy of the developer. But the temperature requires to be kept down during the whole time of development. If

that is done, an over-exposed plate will develop almost as good as one correctly exposed, and there is the advantage in the method that if the image does not come up in the chilled developer after all, it is an easy matter to raise the temperature gradually by small additions of warmer water.

Metol for Over-Exposure

Another very good plan of dealing with gross over-exposures is by using ordinary metol according to a special formula. Metol is usually thought of as a developer more suited to under-exposures; and so it is when made up with an alkali, on account of its slowness in producing contrast or hardness. But it can be used with sulphite alone—no alkali,—and is then a much less energetic developer, yielding vigorous negatives on plates which have been greatly over-exposed. The developing formula is: Metol, 130 grains; water, 20 ounces; to which is added, when the metol has dissolved, soda sulphite (cryst), 3 ounces. Bromide may be further added to the extent of half a dram of 10 per cent solution for every three or four ounces of developer.

Stand Development

The system of developing for hours in a very weak solution has lost whatever vogue—chiefly in France and Germany—it ever had. I mention it here in order to make one or two notes upon it for the benefit of those who may be so circumstanced as to use the system with advantage. It is obvious that a developer little prone to stain or oxidation requires to be used. Glycin is the most suitable. Oxidation of the developer is not avoided by inclosing the solution in even an air-tight tank, for the oxidation usually come from air dissolved in the water. Early advocates of stand development stated that plates would not develop beyond a (usually) low density. This is so if the developer practically exhausts itself by oxidation, but such a method is very liable to yield uneven negatives. If the developer retains its (weak) energy to the end, it will not do to assume that the density will be just so at the end of 12 hours; it may too great. Moreover, you can't assume that if a 10-times-diluted developer yields a certain density of negative in 20 minutes, the same, 30 times diluted, will

ive the same result in an hour. Oxidation of the developer upsets all such calculations as this. In short, stand development is greatly discredited as an automatic process at the present time. For it gives nothing which the time or factorial method will not give with as much certainty in a tenth or a twentieth of the time and at less inconvenience.

Tentative Development in Tanks

Before I come to time development, let me say a word on the use of tanks instead of dishes, when developing by inspection. A tank, to hold six or twelve plates, has, in the first place, the great advantage of saving table space. It allows of considerably more plates being handled at once, and so is a great saver of time. And it is all to the good that plates in a tank are necessarily shielded from the darkroom light during development. The form of tank is not a matter of such moment as it is in time development, particularly when the latter is done in daylight. For lasting wear and ease of cleaning, the porcelain grooved tanks are first-rate, but their defects are the rather large quantity of developer required for a given size of plate, and the fact that odd groves are often wrong in width and let a plate slip out against its neighbor. Glass tanks require less bulk of developer, and usually are more accurately made. But whichever you buy, see that the tank is deep enough to allow half an inch or so over the upper edge of the plates. Some tanks have to be brimful to cover the plates, and are very messy in use. The metal tanks, with loose racks and water-tight lids, offered by many manufacturers, are well designed, but the life of a metal tank is short as compared with that of porcelain or glass, unless one is particularly careful to dry it thoroughly after use. Large users, such as professional or commercial photographers, will find the tank system introduced by Mr. E. B. Core, a few years ago, perhaps the most practical solution of this detail.

Loading Plates into Tanks

The best plan is to put the plates into the empty tank, taking care to place the film sides all facing one way, preferably to the left. When all are in, pour the developing solution in one quick "plump"

into the tank. The force of the solution dislodges air-bells from the emulsion-surface, and saves the trouble of removing each plate again and going over with a tuft of cotton. If at the start, you lower each plate into the developer in the tank, or pour in the developer gently, negatives often suffer from white spots due to air-bells. The vigorous dumping in of the solution avoids this. Also it is well to pour the developer off and re-apply it, say, twice in the course of the usual time of development. There is no real need to do this if the plates are separately moved, or the whole bulk of the developer kept gently on the move. If the solution remains quite still for the whole time, peculiar halo markings and dark bands are liable to be produced. They occur along lines marking the junction of a light and a dark area, and are caused by the diffusion downward of developer unexhausted by action on the upper shadow portion.

A common instance of this defect is a sky-line in a subject of houses, etc. If the plate stands in the tank with the sky portion below, the developer from the upper part will gravitate downward to the extent of yielding a band of greater density above the outline of the houses, and often, even, streaks of extra density running from each chimney-pot across the sky. In the print these white markings are sometimes quite pronounced—it depends on the subject and the position of the plate in the tank—but they are entirely avoided by occasional moving of the developing solution. I have never known them occur when plates have been taken out of a tank every now and then for examination.

Tank and Time Development

Although volumes have been written on this system of development, its successful practice can be embodied in a few simple rules. As I have said, the system consists in the use of a given developing solution for a given time at a given temperature. Once the time required by the developer at a particular temperature has been found by previous trial, the essentials to success are (1) to remember that the time applies to the particular plate and will probably be different for any other brand or speed of plate, and (2) that the tempera-

ture of use must conform to that of the trial. In both trial and regular use, the temperature needs to be the correct figure, not merely at the commencement but throughout the whole period of development. If these two facts are recognized, the system is an excellent one, for the reason that adherence to a fixed time of development makes you avoid over-developing under-exposures, and under-developing over-exposures, the two things which are the most frequent faults in everyday negative-making.

Why Tank? There is no magic in the use of a tank for time development. It is used simply because the system is adapted to the development of a number of plates at one time, and the solution keeps steadily at one temperature in a tank better than in dishes. Usually the tank is one of the metal pattern, with a loose rack for the plates. If for use in daylight (after the plates have been put in), the lid must be water-tight as well as light-tight, in order to allow of the tank being stood first on one end and then on another, for the avoidance of halo marks by stagnant developer. If working in the darkroom, it suffices to mix the developer two or three times by moving the rack up and down. Other things being equal, the greater the distance between the plates, the better the tank. A rack in which plates are placed two in a groove, back to back, often allows more room between emulsion surfaces, and is better for that reason; although, for convenience in working, it is far better to have the plates all facing the same way.

Tank and Time Developers With the exception of pyro-ammonia, any developer *can* be used on the "time" system, though some are more suitable than others. Hydroquinone alone, for example, is not a good developer, because an accidental drop in temperature greatly lengthens the time of development. A "time" developer requires to keep fairly well in single or two-solutions, and the formula of the latter is best of a single form requiring the A and B solutions to be mixed in equal parts, with addition of so much water. Pyro-soda makes a good "time" developer; so do metol-hydroquinone, glycin, and rodinal. I am not going

to give a formula. Let the reader take a formula which he already uses, but adding three or four times its bulk of water to the working solution as made up for dish development. If it is a pyro formula, use a solution of 1 ounce soda sulphite in 20 ounces water, instead of plain water. Try this (weaker) developer as described in the next paragraph, and, if the time for the required degree of contrast is too long, use less water. If too short, use more water; but don't alter the proportion of the A and B solutions, or make other addition, such as bromide, to the mixture. A useful average time of development at 65°F. is 20 minutes.

Finding Development Time

Expose three plates correctly by meter in quick succession, choosing a subject with good range of light and shade in it, e. g., a building in sunlight with part in shadow and with some clear sky in the picture. With the darkroom at the temperature required for the test, develop all three plates together in one dish. Remove one as soon as you would call it "nearly developed," noting the time it has taken. Take out the next when satisfied that it is "fully developed," again noting the time, and keep the third in for a further time, about equal to the interval between the removal of Nos. 1 and 2. You will thus get three negatives of different degrees of contrast, and from them you can choose the time corresponding with the type of negative you prefer. For enlarging or gaslight printing, the least developed will probably be the best; the more contrasty negatives are suited for bromide and carbon printing. In making this test with developers such as pyro, metol-hydroquinone, or glycin, you can go fairly well by the look of the negatives. With rodinal, you will find that you need to develop fairly fully (as judged by appearance) for N. 1, and guess at the times for plates Nos. 2 and 3.

Temperature in Time Development

It is of prime importance for the developer to be at the scheduled temperature corresponding with previous trials, and for it to remain so during development. Test with a thermometer, but don't think that a developer which you made register

65°F. by using some warm water in diluting the stock solutions will stay at 65° if the dark-room is 50° or 40°; or, *vice versa*, that developer iced to 65° will remain at that with a room at 80° or 90°. The best steadier of temperature is to have the room at the temperature at which you want to develop, but, failing that, the most satisfactory plan is to surround the tank with a non-conductor of heat. A good-sized wooden box, stuffed with absorbent cotton makes a good insulator. The tank stands in the middle with, say, four inches of cotton around and below it, and all the better above it too, by tacking plenty of cotton to the lid of the box and shutting it down. Or the tank may be stood in a large vessel of water of the required temperature. But beware of drastic measures, like standing the tank on a hot plate or in hot water; it is difficult to control the temperature properly, and there may be uneven or streaky development.

Factorial Development

Development by "time," as we have seen, is a system which limits us in several ways. It limits us as to the plate; for plates vary considerably as regards the total time required for development. It limits us as to temperature; for time of development varies again according to the temperature at which the developer is used. The advantage of the factorial system of development, invented by Mr. Alfred Watkins, is that it releases us from these two limitations. It is still a "time" system, but one which compensates for the effect of temperature and of the nature of the particular plate.

The Factorial Principle

The principle of the method is that, for every developing solution, there is a definite proportion between the time required for the high-light to appear on the plate and the time required for the plate to reach some chosen standard of density or contrast. For example: Suppose, with a pyro-soda developer, the image begins to appear 30 seconds after pouring on the developer and reaches the required density in 4½ minutes (270 seconds). In other words, the total time of development is nine times the time of appearance of the image, and we can use this number, or factor, for ascertaining the total

time of development when the image appears in a longer or shorter time, *as the result of using a different plate or working at a different temperature*, and when aiming at the same degree of contrast. Thus, if the time of appearance is 50 seconds, the total time of development will be $50 \times 9 = 450$ seconds, or 7½ minutes. The words italicised above require to be especially noted, because the system works effectively only when the plate has been correctly exposed. It will not do to base the total time of development on a time of appearance which is shorter or longer as the result of considerable error in exposure, but the system has the advantage of preventing one from taking an over-exposed plate out of the developer too soon. On the other hand, with under-exposure, as shown by the image taking a long time to appear, the factorial method indicates a time which is too long, and thus, if wisely used, saves one from the mistake of producing dense, unprintable high-lights by trying to force out shadow detail by long development. It is a fact that, with unrestrained developers, all possible detail is obtained in less than the total time indicated by the factorial method.

The Method in Practice

But let me come to the simplicity of the method in practice. We have to develop, say, half a dozen plates (they may be different makes) in exposing which we have used a meter and made sure of reasonably correct exposure. We are developing with rodinal, the factor of which for average contrast is 40, rodinal being a developer which brings out the image quickly, but requires a relatively longer time to give density. It is convenient to use one of the special clocks to get the time of appearance of the image. The general pattern is one with a large "seconds" dial and smaller "minutes" dial, both being brought back to O by pressing a lever, whilst the same or another lever starts both fingers again. With the finger of each dial at O, we pour on the developer and start the clock. The image begins to appear in, say, 12 seconds. That means that the total time of development is $12 \times 40 = 480$ seconds, $= 8$ minutes. A neat form of calculator is supplied by the

Watkins Meter Company for dispensing with arithmetic in the darkroom, but a really more practical plan is to write out in bold figures a table giving the total times of development for various times of appearance, e. g., for rodinal.

Time of Appearance: *Seconds* . . .	5	6	7	8	9	10	11	12
Total Time of Development: *Minutes* . .	3¾	4	4¾	5¼	6	6¾	7¼	8

Cover up the plate and let it develop with an occasional rocking until the minute hand of the clock registers the prescribed time.

Several Plates at a Time

But usually, as in our present case, we have several plates to develop, and naturally don't want to use a clock for each, nor to wait until one is finished before starting the next. Have any ordinary clock going somewhere in the darkroom where it is easily seen. Use it only for telling when to take out the plate. For timing appearance of the image, the best thing is a stop-watch, which can be set going by one pressure, stopped by another, and brought back to starting point again by a third. Make a note of the time by the clock, pour on the developer and at the same time start the stop-watch. As soon as image appears, stop the watch, note the number of seconds and, from a look at the table, see how long the plate must be kept in. Then add on that time to the previous note, and you are ready to go on with the next plate.

This all sounds horribly distracting in cold print, but it is soon second nature in the darkroom. Thus:

Time of appearance, 12 seconds; time by clock at start, 7.20.
Development time for factor 40, 6 minutes; add 6 minutes.
Take out plate at 7.26.

You see that, within half a minute, you are free to develop the next plate, and in this way can quite easily keep five or six plates in hand, which usually is as many as one wants at a time.

Developer Factors

Mr. Watkins and some few others have published factor figures for various developers. Let us be clear what these figures mean. They are factors chosen for the purpose of yielding, when the system is used, negatives having a medium degree of contrast. Thus a low figure (short factor) of 5 is chosen for hydroquinone, whereas metol has one of 30 assigned to it. Ordinary experience tells us that hydroquinone is a developer which quickly piles on density, once the image has come out; whereas metol brings the image out quickly, but is slow in giving density. The use of particular factors enables us to employ developers with a fairly high degree of certainty as regards the vigor of the negative. As in "time" development, it is well to make one or two preliminary trials of the developer in order to fix upon the factor which gives the sort of negative required.

Finding the Factor

In doing this, proceed as already directed in time development, but note also the time of appearance of the image in the case of each of the three negatives. Note also the total time of development. Then, by dividing each total time by its respective time of appearance, you will get a series of three factors from which you can choose for regular work according to the negative.

Some Factors

In the case of most developers, the effect obtained by the use of a given factor does not vary with the strength of the developer. If a weaker developer (more water) is used, the time of appearance is longer; but, if development be continued as indicated by the factor, the result corresponds with that obtained in the same way with the stronger form of the formula. Factors for negatives of average vigor are as follows: Hydroquinone or adurol, 5; metol, 30; rodinal, 40; glycin, 8 to 12; eikonogen, 9. In the case of pyro and amidol, the factor varies according to the strength of the solution in the developer proper, e. g., pyro soda (without bromide) has factors as follows:

Pyro, grains per ounce of working developer	1	2	3	4	5½
Factor	18	12	10	8	6

Amidol varies in the same way according to the strength (in amidol) of the working solution. In other words, these developers, when used strong, are of a short-factor type like hydroquinone but, when used weak, are of the long-factor soft-working type, more akin to metol or rodinal. In theory it doesn't matter, so far as the density and vigor of the negative are concerned, which type of developer you use, so long as you develop for the right time. While this is broadly true, it must be remembered that it is true only when exposure has been reasonably correct. If a plate is over-exposed, there is a great advantage in using a short-factor developer; if under-exposed, a long-factor. Pyro, with its range of factors, according to dilution, no doubt owes its supremacy largely to this duplex character.

Some Factorial Cautions

I have said that temperature is compensated for by the factorial system; and so it is in the sense that the system holds good for developing solutions of any temperature from 45° to 75° F. But the system does require that the developer remain at the same temperature through the whole period of development. If the solution is 65° at the start, and gradually drops to, say, 50° in a chilly darkroom, it is obvious that the action will fall off toward the end, and the negative be less vigorous than it should be. Conversely, a developer which becomes gradually warmer will yield too much vigor.

Another point to bear in mind is that there should be enough and to spare of the developing substance in the quantity of solution used on the plate. Mr. Watkins takes 2 grains of pyro as sufficient to leave a margin for a quarter plate ($3\frac{1}{4} \times 4\frac{1}{4}$ inches), which means that, when using a weaker developer, proportionately more of the solution should be taken; e. g., 4 ounces of developer containing half a grain of pyro per ounce of solution. This is a point of which it is easy to lose sight. Also remember that developer is used up by its own action on plates. For this reason, pyro and amidol developers should not be used twice, as the once-used solution has a smaller factor, though how much smaller there is no means of telling. Other developers can be used several times in succession.

Thermo Formulas

A modification of the factorial system is the Thermo method of development, introduced by Ferguson, and later systematized by Watkins. This method makes due allowance for the temperature, but makes no allowance for variation of different brands of plates, and so requires a first test to determine the time of development and the dilution of the developing solution for a particular plate. Apart from its accuracy, the method does not necessitate the use of a darkroom light or or any observation of the plate, whether development is done in a tray or in a tank. A clock, or some means of measuring time, a thermometer to give the temperature, and a set of tables to adjust time and temperature to a given formula are needed for the working of the method.

By permission of the American Photographic Publishing Company, I am enabled to reprint here the Standard Thermo Formulas, Table of Temperatures, and Table of Relative Development Speeds of Plates:

Table of Temperatures

Degrees Fahr.	Minutes Tray	Minutes Tank	Minutes Tray	Minutes Tank
	T.C. 1.9		T.C. 2.6	
80	3¼	12	1¾	7¾
78	3½	13	2	8½
76	3¾	14	2¼	9½
74	4	15	2½	10¾
72	4¼	16	2¾	11¾
70	4½	17	3	13
68	5	18¼	3¼	14½
66	5¼	19½	3¾	16
64	5¾	21	4	18
62	6¼	22½	4½	20
60	6½	24	5	22
58	7	26	5½	24½
56	7½	28	6	27
54	8	30	6½	30
52	8½	32	7½	33
50	9¼	34	8½	37
48	10	37	9½	41½
46	10¾	40	10½	46
44	11½	43	11½	51½
42	12¼	46	12¾	57
40	13¼	49	14½	63

Table of Development Speeds

Ansco Film, ms. Barnet—Superspeed Ortho, m; Extra Rapid Ortho, ms. Red Seal, m; Red Diamond, ms; Self-screen Ortho, ms. Central—Special XX, s; Special Home Portrait, s; Special, m; Special Non-halation, ms; Comet, m; Colornon, mq; Panortho, mq; Cramer—Crown, s; Anchor, mq; Banner X, s; Inst. Iso., mq; Med. Iso, mq; Commercial Isonon, mq; Portrait Isonon, m; Trichromatic, mq; Spectrum, mq; Slow Iso, mq; Contrast, vvq. Defender—Vulcan, m; Vulcan Film, s; Ortho, mq; Non-halation Ortho, mq; Slow, vvq. Ensign Film, ms. Forbes—Challenge, vq; Snapshot, q; Hammer—Special Extra Fast, ms; Extra Fast, m; Aurora Ex. Fast, ms; Ortho Ex. Fast, m; Ortho Non-hal., m; Fast, mq; Slow, vq. Ortho Slow, vq. Ilford—Monarch vs; Zenith, vs; Special Rapid, vs; Rapid Chromatic, m; Ordinary, q. Imperial—Flash Light, m; Special Sensitive, mq; Orthochrome S.S, mq; Special Rapid, s; Orthochrome S.R., ms; Non-filter, mq. Kodak—Speed Film, s; N.C. Film, s; Kodoid Plates, s; Portrait Film, s; Lumiere.—Sigma, s; Blue Label, mq; Film, s; Ortho A, m; Ortho B, mq; Panchro C, ms; Slow, m. Marion—Record, s; P.S., ms. Paget—xxx m; xxxxx, ms; Swift., s; Ex. Spec. Rap., s; Ortho. Ex. Spec. Rap., mq; Panchro Ord., q; Panchro Color, vq; Spec. Rap., s; Hydra Panchro, mq; Hydra Rapid, mq. Premo film pack—s. Roebuck—Blue Label, s; Ortho, m; Double-coated Ortho, m. Seed—Graflex, s; 30 Gilt Edge, ms; 27 Gilt Edge, ms; 26X, ms; 23, mq; Color Value, m; L Ortho, mq; C Ortho. vq; Non-halation, mq; Panchromatic, vq. Standard—Extra, m; Imperial Portrait, m; Orthonon, mq; Polychrome, mq; Thermic, mq. Stanley—50, m; Commercial, mq. Wellington—Extreme s; 'Xtra Speedy, ms; Film, ms; Iso Speedy, m; Portrait Speedy, m; Anti-Screen, m; Speedy Spec. Rap, m; Ortho Process, m; Wratten—Panchro, mq; Process Panchro, q.

Thermo Formulas

Watkins thermo pyro-soda T. C. 1.9—*A.* Potassiummeta bisulphite, 80 gr.; Pyro, 160 gr.; Sodium sulphite, dry, 1 oz.; Water to make 10 oz. *B.* Sodium carbonate, dry,

2 oz.; Potassium bromide, 40 gr.; Water to make 10 oz. **Modified Thermo** M-Q. T. C. 1.9—*A*. Potassium metabisulphite, 60 gr.; Metol, 30 gr.; Hydrochinon, 90 gr.; Water to make 20 oz. *B*. Sodium sulphite, dry, 1 oz.; Sodium carbonate, dry, 1½ oz.; Water to make 20 oz. **Modified Thermo** D-Q.T.C. 2.6.—*A*. Potassium metabisulphite, 60 gr.; Duratol, 30 gr.; Hydrochinon, 90 gr.; Water to make 20 oz. *B*. Sodium sulphite, dry, 1½ oz.; Sodium carbonate, dry, 2 oz.; Water to make 20 oz.

Instructions Look up the Development Speed of the plate or film and mix the developer as directed for that class, USING WATER WHICH HAS STOOD IN THE ROOM LONG ENOUGH TO ATTAIN ROOM TEMPERATURE. In safe ruby light (or total darkness) place the plate in the tray, flow it with developer, cover the tray light-tight, and note the time. We recommend handling plates in total darkness and using white light while they are covered. Now observe the temperature of the room and consult the Table of Temperatures, where the correct time for development will be found opposite the degree and under the Temperature-Coefficient (T.C.) of the developer in use. The tray may be rocked now and then during development, but the plate should not be removed from the solution until the time is up. Then turn out the white light and rinse and fix the plate by safelight or in a covered tank.

If the first trial does not give the right printing quality to suit your requirements, classify the plate one class nearer VS for more, or one class farther from VS for less, contrast.

DILUTION OF DEVELOPER.—	VVQ	VQ	Q	MQ	M	MS	S	VS
Watkins Thermo Pyro-Soda.	1	1⅓	1¾	2¼	3	4	5	6¾
Modified Thermo M.-Q. . . / Modified Thermo Duratol.	1½	2	2⅔	3½	4½	6	8	10

drams of each stock to be diluted to make total volume 3 ounces for tray or 10 ounces for tank development

Rodinal (Citol)............	20	26	35	45	60	80	105	135

minims. Solution to be made up to 3 ounces for tray or 9 ounces for tank. T. C. 1.9. A few experimental trials with negatives at different stages (classes) will determine choice.

A single portion of this developer should be used for only one plate, but the used developer (except pyro) should be saved for paper. If fog occurs, add to each ounce of water used for diluting, 7½ to 10 grs. dry sulphite. An interesting paper describing the application of this method to the famous "B. T." pyro-soda developer, with a time-table and dilution scale for use with different brands of plates, may be found in the British Journal of Photography, July 9, 1915.

Various Methods

Now I must turn to other methods which don't belong to any particular system of development, but nevertheless include among themselves several expedients of practical value. It would be possible to expand this miscellany at great length by quoting from past numbers of The Photo-Miniature, for almost every specialist in some branch of photography has dealt, in these monographs, with his own methods of development for such subjects. See, for example, the Wallace Time and Temperature Methods in The Photo-Miniature No. 134. Here my aim is to bring to your notice methods of general application.

Intermittent Development

Among these, I give a leading place to a very simple and yet useful plan for avoiding harshness of gradation,—in other words, for flattening the scale of tones, and so far making a satisfactory result in cases of over-exposure. It consists in letting the plate develop for most of the time, only with the quantity of solution which the film will absorb, dividing the whole time of development into successive short periods, at the end of each of which the plate is allowed to absorb more developer simply by keeping the solution on it again for a few seconds. By this plan the strength of the developer is soon exhausted in the high-lights. Action therefore stops there, whilst it still goes on in the shadows, thus securing the sort of action one wants with an under-exposed plate. In other words, we get, during development, the kind of result which otherwise we should seek to obtain with the persulphate reducer afterwards. The process is: Place the plate in the developer for five seconds, rocking it the while. Then pour away all the solution and

leave the plate to itself for, say, a minute and a half. Re-apply the developer for five seconds, and repeat the process four times in all, but, after the fourth application of the developer, and pouring off of the solution, leave the plate to itself for four minutes. Thus the plate is developed altogether for nearly nine minutes, but it is in the solution only twenty seconds of this time. No special formula is needed. The method works with any, though it is best to use a half-strength or quarter-strength solution. But, whatever developer be used, the contrast is markedly less than that by developing in the ordinary way.

Development for Non-Halation

The disfiguring effect of halation can be very greatly if not entirely avoided by judicious development even when an unbacked plate or one not of the special anti-halation kind is used. Broadly, there are two ways of going to work, and, for success with either, the plate requires to be fully exposed. Four times the normal exposure is not too much. The first plan is the very simple one of developing quickly with a solution which yields contrast readily. Avoid developers which require a relatively long time to yield vigor. The principle of the method is to obtain an image of full vigor on the upper layers of the emulsion before the halation (which occurs in the lower layers) has a chance of being fully brought up. Without saying that other developers, such as hydroquinone or pyro, would not do as well, I can speak for a glycin formula made up as follows: Glycin, 180 grains; soda sulphite (cryst), 1 ounce; potass carbonate, 2 ounces; water, 20 ounces. This developer is used for two minutes. Development must take place freely and quickly, otherwise the halation makes its appearance; in fact, there is nothing like forced development for aggravating halation in a negative.

The second method consists in applying a developer containing the minimum of alkali (soda carbonate), and thus carefully bringing up the fully exposed image on the surface without touching the lower and weaker halation image below. Again, over-expose several times and develop with a solution containing about two grains of pyro and twenty grains soda sulphite

(cryst)| per ounce of developing solution. If you are using, say, 10 ounces of developer add about 10 drops only of the soda-carbonate solution of 10 per cent strength. It is not possible to say exactly how much carbonate, but very little—only enough to bring out the image on a four-times exposed plate in two or three minutes. When the image appears (after this time), you may add a few drops more of the soda solution, and so on until the plate is fully developed. Working in this tentative way, the plate should take about twenty minutes to develop, but the time and care are well expended in securing beautifully crisp results, such as interiors with windows.

Night Photographs

A method on the lines of that just described serves to produce the most beautiful results in the photography of subjects such as outdoor night scenes, where there are strong artificial lights in the field and extreme contrast between high-light and shadow. A very experienced worker in this branch, Mr. R. Williamson, uses the pyro-soda in this way with very great success. I give his method from a paper read before the Royal Photographic Society: *Solution A*, pyro, 60 grains; potass metabisulphite, 30 grains; water, 5 ounces. *Solution B*, soda carbonate, 1 ounce; soda sulphite, 1 ounce; water, 20 ounces. For each dish, take half an ounce of A, 2 drams of B, and add water to make 2 ounces, with 1 to 4 drops of 10 per cent potass bromide. Flood the plate, taking the usual precautions against air-bells. Rock the dish occasionally for five minutes, then add another 2 drams of A, and in another five minutes the high-lights should appear, showing that the exposure is correct for this developer. Upon the appearance of the image, dilute the developer with one ounce of water, and continue diluting as the density increases.

Remove the plate from the developer, and rinse under the tap for a few seconds. When the high-lights attain the required density, then place in a dish of plain water for about ten to fifteen minutes, to soak. This soaking enables any developer still remaining in the emulsion to act, and brings out the finer shadow details or under-

exposed parts. Finally fix in acid hypo, i. e., the usual acid hypo fixing bath.

Diluting the developer at the proper time is most important. It prevents the high-lights acquiring too much density, whilst allowing the shadows and other under-exposed parts a chance to build up detail during the latter stages of development.

In case the image first appears in less than ten minutes, the negative has been over-exposed. The developer must be further diluted and one drop or two more bromide added, and sometimes a little of solution A. On the contrary, if the first appearance is over ten minutes, the negative is under-exposed. The developer must not be altered, but continued until the high-lights build up some little density, when it must be diluted, and often a little of solution A is required to produce the necessary density. As regards using bromide, it is found that the best temperature for avoiding halation and developing shadow detail is 55°F. At a higher temperature than this, more bromide must be added; less is used if the temperature is lower. The ranger of variation may be put at from one to four drops of 10 per cent potass bromide solution in two ounces of the working developer given above.

Local Development in Portraiture

With negatives of fairly large size (8 x 10 and over), there is great opportunity of controlling the results by localized development, particularly in portrait subjects. We all know how light draperies choke up and lose their printing power, while other parts of the subject, such as the hair or dark articles of dress, still lack detail. With a brush, or tuft of cotton, much can be done to adjust matters either by restraining or accelerating one part or another. Restraint of high-lights with bromide is an awkward system; you are almost in the dark as to what you are doing. Much more workable is the system of bringing up the image slightly in a normal developer, washing this off, and then flowing a pyro and sulphite solution only onto the plate, and making it active at any required part by applying diluted carbonate solution with brush or cotton. Working this way, you see what you are doing; it is a kind of painting by

development. Mr. Ryland W. Phillips, who has given it his advocacy for portrait work, prefers to use a one-inch camel's hair brush for the first local application of the carbonate, afterward putting in lighter accents with a much smaller brush. Negatives to be developed in this way should be slightly under-timed, for full exposure is apt to get out of hand by this method

Holiday Exposures

Perhaps this heading will serve as well as any other under which to direct methods for dealing with a large batch of plate or film exposures, so as to compensate as far as may be for errors of exposure, and yet not to waste a lot of time over the job. There are several plans of working which one can adopt in order to avoid aggravating any errors of exposure by unsuitable development. One which I have used on many occasions for batches of plates running from 50 to 500 is to use two open tanks. One contains a somewhat weak developer of a kind which brings up the image quickly. Rodinal of 1 in 40 strength serves excellently for this. Call it No. 1. The other (No. 2) tank contains a non-staining developer which yields density fairly quickly. Pyro-soda, made up with plenty of sulphite and with about three grains of pyro per ounce of the working developer, serves well, as does also that little-used but excellent developer, hydroquinone made up with caustic soda. The No. 1 tank should take about twice as many plates as No. 2; twenty-four plates are as many as one can comfortably manage. The plates are loaded into tank No. 1, and the developer dumped in vigorously to cover them. In this developer, it is easy to judge of what each plate requires according to exposure or subject. Raise each plate in turn halfway out of its grooves and have a look at it. Any over-exposures come up quickly with a flat, weak appearance. Remove, rinse for a second or two under the faucet, and transfer to No. 2. Here they put on density fairly quickly and, if you are not afraid to develop after they are black all over, you will get passable prints from even bad over-exposures. Plates which are about right as regards exposure show an image in half to one minute in No. 1, and steadily gain vigor. But, as such a weak developer

is rather slow in yielding density, it is a saving of time to hurry matters by giving them a minute or two in No. 2, after rinsing well from No. 1. Usually it is best to use No. 2 only for finishing off in this way, but if it is a subject where extra pluck is required in the negative it is best to change sooner. As for under-exposures, let them stay in No. 1, and not too long at that. Keep an eye on the high-lights, and avoid getting these too dense; or you may transfer them to a tank of plain water. This sytem of working is applicable to other developers so long as No. 1 is a weak developer which brings out the image quickly, and No. 2 a density-giving solution which does not give yellowish or greenish negatives. There is no real objection to the color, so far as any one negative is concerned; but, when one comes to print, it is a nuisance to have a lot of negatives of different degrees of yellowness, and some (finished in No. 1) without any. It makes it so difficult to judge exposures when printing on development papers or making lantern-slides.

Portrait Negatives in Numbers

Another two-tank method, which is an excellent one for portrait negatives, and for snap-shot exposures which have been somewhat under-timed, is that of my friend Mr. Harold Baker. It is not at all a good method for over-exposures. The plates should be in a loose rack. They are first put for one minute only in an M.-Q. developer without any alkali, viz: Metol, 300 grains; hydroquinone, 120 grains; potass metabisulphite, 2 ounces; potass bromide, 120 grains; water, 100 ounces. After one minute, the rackful is lifted out and lowered straight into tank No. 2, containing: Potass carbonate, 10 ounces; water, 100 ounces. Here it is kept for one or two minutes, then taken out and put to drain for half a minute. Negatives which are dense and "plucky" enough are put to fix; those which are not vigorous enough are put back into No. 2 for a further minute or two. The principle of this method is that each plate carries over a little developing agent, which, in the full-strength alkali, quickly does its work, but by reason of its small amount can't over-develop. There is quite a little latitude in the method. Longer in No.

1, and less time in No. 2, than is given above, yields more vigor; the reverse tends to softness. It is an easy and rapid method in working, and one which can easily be deputed to an assistant, with very little risk of his going astray so long as the bulk of No. 1 is kept up, and No. 2 solution renewed as soon as its action is seen to begin to flag, i. e., if it doesn't give ample density in about one minute. The method can be used with other developers which require an alkali, such as eikonogen, but M.-Q. is hard to beat for its quick action and freedom from stain.

Here space and time force me to end this discussion of modern methods of development. I can only hope that in what we have covered together, the reader will find something of practical help and suggestion. It may be that someone who has looked in vain for a detailed consideration of tank development for roll-films may wonder why this large use of development is but hinted at in these pages. But, to my mind, this method needs no detailed consideration, being, in truth, automatic—for good or evil, according to the exposure. The principles of tank development have, properly, received full discussion. In the tank development of roll-films, as commonly practised, there is nothing to do or say, but to mix the developing solution, put the loaded film apron into the tank, reverse the tank occasionally, and, in due time, put the developed film into the fixing bath. In this method, the exposure controls the result. Or, to use the advertising slogan: The brains are in the tank.

Notes and Comment

Supplementing the recent note in these pages concerning the Buffalo Camera Club, I learn that this Club has just taken and occupied new rooms in the Kinney Block, Main and Utica Streets, Buffalo, N. Y. The new rooms are much better adapted for the work of this progressive camera club than the old location, and are equipped with all the most modern appliances for the helping of its members. The wide-awake amateurs of Buffalo should take advantage of their opportunities and identify themselves with this organization. Dr. John L. Garretson is the President and Mr. W. L. Conklin is the Secretary.

The Kodak Advertising Slogan Competition, wherein $3,000 are offered in cash prizes to amateur and professional photographers, closes at Rochester, N. Y., on the first of November. I would like to urge as many readers of THE PHOTO-MINIATURE as possible to send to the Eastman Kodak Company for the circular giving the terms and conditions of this competition, which is so well worthy of attention. The five slogans to be illustrated offer abundant opportunity for the ingenuity and skill of the photographer, and the rewards are substantial. The terms of the competition are few and simple, and the circular is illustrated with examples of the sort of pictures wanted and not wanted.

The 1915 Year-Book, issued by the Syracuse High School Camera Club, is a handsome brochure of forty pages, filled with the spirit of youth, a few readable articles on photographic manipulation by Prof. E. J. Wall, George W. Kellogg, C. E. Palmatier, and others,

together with a number of illustrations. Evidently the S. H. S. C. C. is a wide-awake and enterprising organization, and I gladly make note of its activities.

I have often wondered why the Photo-Sketch is not more popular among professional and amateur photographers. It has all the attractiveness of the everyday portrait, without its heaviness and over-abundant detail. It offers the photographer a splendid field for the exercise of his individuality, and, as a distinct style in portraiture, it is bound to make a strong appeal to the sitter. What is a Photo-Sketch? It is the usual photographic portrait as far as the head, face and hands are concerned, but with handwork, or more properly, pencil work, taking the place of the usual photographic delineation of clothing and accessories. This pencil work adds lightness and grace to the portrait, giving it, in fact, the peculiar attractiveness of a sketch portrait. An example of the Photo-Sketch may be seen in the announcement of Mr. Corydon G. Snyder, among the advertising pages of this issue. Mr. Snyder has devoted some years to the perfection of his work along this line, and now offers instructions as to the making of this style of portraiture for the modest sum of one dollar. The work is not at all difficult, and readers who are interested in portraiture can hardly spend a dollar to better advantage than in getting the method from Mr. Snyder.

The thousands of travelers "stopping over" for a day at the beautiful city of Albany, N. Y., on their way west, will be glad to know of a new photographic supply shop recently opened at 681 Broadway in that city, by William Russell and John J. Gardiner, under the firm name, Russell's Photo Supply Shop. Both these gentlemen are well known to the photographic trade, and have equipped their establishment with an unusually complete line of the Ansco and Burke & James cameras and specialties, together with a stock of the products of other well-known manufacturers.

The Meyer Camera and Instrument Co., Inc., importers of high-grade European cameras, photographic specialties, scientific instruments and laboratory supplies, have removed to larger quarters at 31-33 East 27th Street, New York, where Mr. Max Meyer, the popular manager of this concern, will welcome old and new friends. The Polygon hand cameras and the Rietzschel anastigmats are two lines which deserve to be better known. Visitors to New York could spend a profitable hour with Mr. Meyer in looking at these two helps to better pictures.

The Herbert & Huesgen Co., has consolidated its various stores, factories and branches in a beautiful six-story building at 18 West 42nd Street, New York. In a later issue I hope to be able to present some account of the new quarters of this enterprising house, which, for elegance and completeness of equipment, perhaps surpasses any similar establishment here or in Europe.

Almost every day there comes to my notice a new opening whereby the man who has a camera may profit by his skill. The New York Herald, for example, offers a weekly prize of $5 for the most interesting picture sent in each week, and will pay $3 for any pictures it may use, sent to it at any time, showing an event of news value together with a few words of description. The Sight Seeing Yacht Co., of New York, which maintains an excursion service upon the rivers and bay surrounding the metropolis, offers cash prizes for the best pictures of New York made from the yacht during the season. In the July number of *The Photographic Journal of America*, the awards are announced in the prize competition recently held by this magazine, in which $200 were offered in cash prizes for pictorial photographs. So *The Camera*, of Philadelphia, has just closed a competition in which $50 were awarded for pictures of old-fashioned subjects, such as old watermills, old homesteads and the like. Readers desirous of keeping in touch with all these offers as they appear

will do well to see *The Editor* regularly. This readable fortnightly for writers and illustrators is published at Ridgewood, N. J., $2 per year.

Twice in The Photo-Miniature Series have I attempted to set forth the pictorial possibilities of night photography, viz: in The Photo-Miniature Nos. 31 and 104. For the illustration of these numbers I gathered the very best then to be found among the night photographs available. But, at last—in the August *Cosmopolitan*—night photography has arrived, and reached a height which, to my thinking, will not be surpassed for a long time to come. In the series of eight reproductions from photographs by Francis Bruguiere we have the nocturnal beauty of the Panama-Pacific Exposition shown as only the camera in the hands of an artist can do it. I recommend every reader who is at all curious about the possibilities of picture-making with the camera at night to see these eight pictures, which are a veritable triumph in photography.

Here are two formulas for tank development which are worth noting: *Glycin Formula.* Hot water, 8 oz.; sodium sulphite (dry), 50 gr.; sodium carbonate (dry), 240 gr.; Agfa glycin, 45 gr. For use take 3 ounces of this solution to 37 ounces of water; develop 25 minutes at 65° F. *For tank development with Rodinal:* Dilute 1 part Rodinal with 60 parts water, and develop 25 minutes at 65° F. A much-favored formula for portraits or artificial-light exposures, using eikonogen, is as follows: Boiling water, 25 oz.; sodium sulphite (cryst.), 3 oz.; potassium carbonate (pure), 1¼ oz.; Agfa eikonogen, ¾ oz. If used at lower than 65° F., this developer gives density slowly, but by warming the developer very slightly, negatives of fine density are secured. By repeated use, the developing solution may become brown, but its working strength deteriorates very slowly.

The Sixtieth Annual Exhibition of the Royal Photographic Society of Great Britain will be held

August 23 to October 2, at the gallery of the Royal Society of British Artists, Suffolk Street, Haymarket, London, S. W. The exhibition will have three sections, devoted respectively to pictorial subjects, color transparencies, and scientific and technical exhibits, including color prints, nature photography, lantern- and stereoscopic slides.

It is difficult to think that, even in this day of miracles, one can obtain an anastigmat lens of the highest quality, fitted with an exposure shutter giving slow and fast speeds up to 1/300th of a second, with absolute accuracy in the variation of the speeds, for as little as $29. And yet I find in the Green Book published by the Ilex Optical Co., 600 Ilex Circle, Rochester, N. Y., that this is the price of the Ilex anastigmat and Acme Combination of 4½ inches focus, for 3¼ x 4¼ plates, or 4 x 5 with the smaller stop. In this class it is also possible to get a similar Combination, of 12 inches focal length, covering 8 x 10 and 10 x 12 plates, for much less than a hundred dollars. A copy of the Ilex Green Book can be had for the asking, and will well repay perusal.

A few days ago I talked with an amateur who brought me the results of an extended European trip made early last summer with the Ensign Folding Reflecting Camera. The collection of prints I looked over included the best from over four hundred exposures. The quality of the prints was remarkable. A folding reflecting camera is one of the few models I have yet to put through the tests of actual experience, so that I was curious to know whether my caller had experienced any difficulties with his camera because of its collapsible or foldable feature. He assured me that the workmanship of the Ensign was so good that he had encountered no difficulties whatever. The folding feature gave the camera wonderful compactness and when extended its rigidity was unquestionable. I am glad to put this on record as embodying a long range of practical experience with this most modern form of reflecting mirror instruments.

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT

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Lens Facts You Should Know

The action of a lens is not the easiest part of the photographic process to explain, although it is the most completely known. Nobody can tell us exactly what happens when the emulsion of a plate is exposed to light—or, at any rate, they have half a dozen different accounts,—but lenses follow established laws of optics, which are known from A to Z. So far as the use of lenses is concerned, photographic optics is easily within the ready comprehension of even those of us with no knowledge of mathematics. Many text-books have weighted the subject with mathematical symbols, and others, professing to be elementary, fail, I think, in trying to explain too much at once. In actual fact, the action of a lens depends on various of its properties which can be considered separately from others. As we shall see, we can learn how its focal length enters into photographic work without troubling about the diaphragm; we can explore the effect of the diaphragm without worrying about the characteristics of different types of lenses. On this plan, we shall have to take very little for granted as we proceed, and we shall find, I hope, that ordinary common sense, *plus* a little arithmetic, is sufficient for a working knowledge of lenses.

What a Lens Does

Let us first get into our minds the essential nature of a lens' action. It is to bend rays of light which fall upon it and bring them all to one point on the other side of the

lens. It has this effect upon each separate set of rays which fall upon its surface from all the points which make up the scene or object before it. Imagine some object such as the knob on the top of a flagstaff, so far off that it seems a mere point to the eye. Light falls upon it and is reflected in all directions, up, down, and sideways. Such reflection of light is, of course, the means by which we see things. A small proportion of the whole number of rays from our distant flagstaff-knob fall upon the lens, but instead, then, of passing straight on, each is bent (refracted) so that all converge to meet at a point beyond the lens; forming there a minute image of the knob. We have imagined our flagstaff at a great distance, so that for practical purposes the rays are parallel when they reach the lens. The point in space at which they meet on the other side of the lens—i.e. after passing through the lens, is the "focus," or, more correctly, the "focus for parallel rays," and the distance from some point in (or near) the lens to the focus is the "focal length" of the lens. It is almost obvious that, if the rays come from a point so appreciably nearer to the lens that they are not parallel when they reach the glass surface, the focus will be farther back than for parallel rays: the lens exerts a certain bending action and no more, and if it starts with a handicap in the shape of actual divergence of the rays falling upon it, the convergence it produces is proportionately less. Hence, in speaking of (and measuring) "focal length," it is understood to be "for parallel rays," otherwise it has no definite or exact value whatever.

The Focal Plane

Rays fall upon the lens in the same way from every point in the subject before it, just as from the knob of our imaginary flagstaff; and the set from each point, in passing through the lens, is caused to meet in a point which lies to right or left, above or below the image of the knob, according to their relative positions in the original scene. Thus numbers of image-points are formed behind the lens, and this assemblage of image-points forms the "focal plane," which is the surface at which the whole image of the subject or scene is formed,

and is rather unfortunately named "plane," for it is hardly ever perfectly flat. The shape of the surface depends on the type of lens, but with none is it a truly dead flat. "Field" is the better word for it.

What is Focusing?

So we understand that there is one distance behind the lens at which an object is formed, point for point, as an image by the lens, and that this picture-image can be seen by the eye by placing a ground-glass screen there. Focusing, for our present purpose, consists in moving the lens or the ground-glass, so that the latter indicates the position of the image. If the ground glass is in front of the focal plane (or surface of image), the whole picture appears blurred because the rays at this point have not fully converged—each set to a point. If it is behind the focal plane, the picture is again indistinct from the rays crossing each other and spreading out to form tiny disks, instead of points. There is one position in which (without the aid of a diaphragm) a sharp image is formed by the lens, and can be recorded by the sensitive plate. As we shall see later on, focusing in practical work is more than this, and involves the use of the stop or diaphragm and of the camera back, as well as the utilization of the shape of the focal plane or focal field of the lens.

Focal Length and Back Focus

The proper name for the distance from a point in (or near) the lens to the sharp image of a distant object is the "focal length," but the common term "focus" will be used here, where no confusion is caused. "Back focus" is a term often met in makers' catalogues. It is the distance from the back of the lens tube to the ground-glass when a distant image is in focus, and serves simply as an indication of the camera extension required by the lens. It may be greater or less than the focal length according to the construction of the lens, such differences, as we shall see later, being of practical service. Here let us realize first that the focus (focal length) is a measure of the bending power of the lens, and has the chief effect of determining the size or scale of picture-image produced at a given distance from the object. The longer the focus, the larger is the

image of an object which a lens forms on the focusing screen. If the object is a long way from the camera, the size of the image is proportional to the focal length of the lens. For example, if a lens of 6-inch focus renders a distant house 2 inches high in the plate, one of 12-inch focus will render it 4 inches in height, from the same standpoint. This simple rule does not work exactly when the object is comparatively near to the camera, but the difference is not enough to "cut any figure," except in photographing something exactly to scale. The rule is quite near enough as a basis for general practical work. Thus, in using one of the casket sets of lenses, giving a wide range of focal length, if the 8-inch lens produces a 2-inch image on the plate, and we want one of 5 inches, a single rule of three sum will tell us the focus of lens which is needed, viz., $8 \times 5 \div 2 = 20$ inches.

Focal Length and Angle of View

Naturally, when the subject is reproduced on a larger scale by using a lens of longer focus, less of it is included on the plate. With a given size of plate, you can't have it both ways. This is what is meant by "angle of view." It is a term which signifies the action of a lens, but only in relation to some particular size of plate. It means that when a given size of plate is filled by the image, the "angle of view" is wide or narrow according as the focus of the lens is short or long as compared with the base line of the plate or film. A medium angle of view is given by a lens of focus nearly double the longer side of the plate, viz., 9 inches on a 4 x 5 plate; 13 inches on a 5 x 7; and 19 inches on an 8 x 10 plate. A wide angle is given by a lens of focus rather less than the shorter side of the plate; and a narrow angle is obtained by a lens of focus nearly three times the long side of the plate. Or you may look at the matter the other way about, and consider that with one lens, say a lens of 5-inch focus, used on a 5 x 7 plate, its action is that of a wide angle over the whole plate, that of a medium angle over a central part 3 x 2 inches, and a narrow angle over a smaller area of 2 x 1 inches. There is a practical meaning to this, viz., that so far as the effect of angle is concerned it doesn't

matter whether your picture is made by using a long-focus lens on, say, a 4 x 5 plate, or a lens of much shorter focus on a small portion only of that plate. The only difference is the size or scale of the picture. If you enlarge the smaller negative, it will be identical with the larger, except that it may not be quite so sharp.

Practical Effect of Angle of View

Now what is the effect of different angles of view, apart from the amount of subject included? It is of practical moment, though unfortunately largely disregarded and confused with other things. Why is it better to use a long-focus lens on a plate or, when a shorter-focus lens is employed, to dispense with a considerable marginal part of the negative. The reason is that the angle at which the lens works fixes the "drawing" of the photograph. If the angle is too wide, the effect produced is unnatural. It is palpably out of conformity with the impression obtained by the eye. It is true that the eye and the camera are very different instruments. We cannot expect to make the camera altogether replace the eye as regards the effect produced, but we can remove the glaring inconsistencies which arise from the lens forming its image over too wide an angle. They are seen in the exaggeration of the foreground, or dwarfing of the distance. Most photographs of roads or streets show enormous breadth in the foreground, and an absurd dwarfing of houses in the distance, as compared with those near at hand. A garden acquires the appearance of a park, in the photograph, owing to the false impression of distance. We so rarely return to the scenes we photograph and compare them with our prints that we are not alive to this fault. In portraiture it *is* recognized: we avoid exaggerated hands and knees by using a long-focus lens. The same fault is pronounced in photographing many subjects which recede fairly directly from the camera, e. g., an automobile, shown end on, a procession, and particularly things like chairs, cups, vases, which are often photographed over an excessively wide angle in the effort to get a large-size image on the plate with a normal-focus lens. The remedy is to use a lens whose focus is greater than the base measure of the plate used.

Standpoint Perhaps you have read that focal length has nothing to do with the perspective of the subject; that perspective is solely conditioned by the standpoint of the camera. Taken literally, both of those statements are perfectly true, and they are strictly in accordance with what I have written on angle of view. The latter and the position of the camera are interdependent. With any lens, if you want to work at a narrow angle and to include the subject on the plate, you must take a distant standpoint. If you approach nearer, you don't get in all you want. In presenting the subject here, I have chosen to look at it from the point of view of angle included on the plate, rather than by way of advocating a distant standpoint. Human nature being what it is, it is a more emphatic plan to say: "Use a lens of 10-inch focus on a 4 x 5 plate" than it is to say: "Avoid too near a standpoint for the camera." The user of the 10-inch lens *has* to take a different standpoint in order to include the subject on the plate. If all he wants is not included, then, of course, he must use a shorter focus. In landscape photography and other branches, it is just as practicable to use the long-focus as the short: there is plenty of room to get back and the lesser amount of subject is better pictorially. For interiors and much commercial photography of buildings, it is impossible to get far enough away from the subject to work at a narrow angle; and then a shorter-focus, or even a wide-angle, lens must be used. And as I refer here to "wide-angle" as a special kind of lens, which it is not, I ought to explain why I do so.

The Wide-Angle Lens We have seen that long focus (as compared with the plate) means narrow-angle; short focus, *vice versa;* and that a lens may act as narrow-, medium-, or normal-angle according to the size of the plate. It requires to be noted, however, that the ability to cover a plate sharply over a wide angle is the result of quite special construction. Hence, a lens which will do this is probably designated "wide-angle" by its makers. It ceases to be a wide-angle when used on a much smaller plate. As we shall see, many modern lenses, when used with a

small stop, serve almost equally well as the special wide-angles; that is, they cover a plate considerably larger than the one for which they are listed. The fact is sometimes overlooked by the photographer, who thinks that he must get a special wide-angle lens for this or that special subject, when he may have among his other instruments an anastigmat which, with stopping down, will answer perfectly.

Some Angles of View

Perhaps, before I leave this subject of angle of view, I had better give a few round figures for focal lengths which afford various angles on plates in general use. The following table does this:

Plate Inches	Narrow-Angle (20°)	Medium-Angle (30°)	Normal-Angle (45°)	Wide-Angle (72°)
4 x 5	14 inches	9 inches	6 inches	3½ inches
5 x 7	20 "	13 "	8½ "	4¾ "
8 x 10	28 "	19 "	12½ "	7 "

By normal-angle in column 4, I mean the angle given by the lenses usually fitted by the makers of hand-cameras or camera sets. Such focal lengths are fitted or recommended because they allow of inclusion of most ordinary subjects on the plate. It is, nevertheless, a fairly wide angle, and much inferior to one of 20° or even 30° as regards securing pleasing drawing or perspective of the subject. Those who want to find the precise angle included by any lens on any size of plate may use the chart given on page 54 of "Figures, Facts, and Formulæ": THE PHOTO-MINIATURE NO. 134.

Measuring Focal Length

Having said so much on the effect of focal length, it is time to give one or two simple but sufficiently exact methods of measuring it. In the case of a single or landscape lens (that is, one composed of one glass cell only), or in that of an R R lens (before the days of anastigmats), all that is necessary is to focus sharply on a distant object, and then to measure from the ground-glass to the back surface of the single lens, or to the stop in the case of an R R. But that plan is liable to considerable error

with some more modern lens. In defining focal length, I said it was the distance from a point in or near the lens to the sharp image of a distant object. It is not easy to find where the point "in or near" the lens really is, with many modern types and lenses, and therefore the best thing is to use a method which dispenses with a knowledge of its position, viz., as follows: First focus the lens on an object at an "infinite" distance. By "infinite" we mean at least five hundred times the focal length of the lens approximately. Farther does not matter; somewhat nearer will affect the measurement very little. Usually a distant spire, house, or chimney, can be found. With the "infinite" object in focus, mark the position of any movable part of the lens-board on the fixed-camera base-board. Then place some marked object, such as a foot-rule, in front of the camera, and focus to get the image the same size as the original, but moving the camera as a whole, using the same focusing adjustment you used in the first instance.

The object is to measure exactly how far the lens must be moved farther from the plate in order to obtain a same-size image. This distance, which is easily found by measuring the separation between the two positions of the moving base-board, is the focal length of the lens. It is an easy method and, with careful focusing and measurement, correct to within one-sixteenth of an inch.

Focal Distances

If we know the focal length of a lens, it is a very simple matter to calculate the distances from lens to plate and from lens to original in copying; or to paper and negative in enlarging. Calculations of this kind will save an enormous amount of trouble when making copies, designing enlarging-boxes, and similar work. It will be understood that, in photographing such near objects, the rays which reach the lens are not parallel; they are still more or less divergent, consequently they are brought to a focus farther behind the lens than are parallel rays from a distant object. In other words, the lens has to be racked out farther, and the amount of this racking-out follows a very simple rule, which we

can use without encumbering ourselves with unnecessary mathematical formulas.

Extra Focal Length

When copying or photographing, say an 8 x 10 photograph down to 4 x 5 size, the extension of the camera, as we know, has to be that for a distant object *plus* a little bit more. The "little bit more" is not a chance distance, but depends on the focal length of the lens and on the degree of reduction. It is, in fact, the focal length divided by the degree of reduction. As we know both of these, it is an easy matter to calculate the "little bit more," or "extra focal distance," as the opticians prefer to call it. In our example, the degree of reduction is 2. It is linear reduction, not the reduction of area, that we are concerned with, and $10 \div 5 = 2$. Suppose our lens is of 8 inches focal length, then the extra extension (beyond focus for distant objects) is $8 \div 2 = 4$. Note that the whole extension—lens to plate—is not necessarily the focal length and the extra bit added together, viz., 12 inches. With single lenses and old R R's it will be that, but some modern lenses are peculiar in having a back focus which is appreciably shorter (with some, longer) than the focal length. But the rule, as just given, holds good in all cases: Divide focal length by degree of (linear) reduction. The result is extra extension or rack-out of camera required beyond that for distant objects.

The same rule is applied in a still simpler way to find the distance the original requires to be from the lens. This distance is the focal length of the lens, *plus* the focal length *multiplied* by the degree of reduction. In our example: 8 (focal length) $+$ 8 (focal length) $\times 2$ (degree of reduction) $= 8 + 16 = 24$ inches.

This rule holds good in all copying and enlarging work. In copying on a reduced scale, the shorter distance is from lens to plate; in copying on an enlarged scale, or in enlarging from a negative in the ordinary way, the longer distance is from lens to plate or paper.

Conjugate Foci

The full distances on either side of the lens from it to the original (in one direction), and to the sharply focused image (in the other), are called by opticians the "con-

jugate foci," and stand always in a fixed relation to each other. Whatever the focal length of the lens, the larger conjugate focus is equal to the smaller multiplied by the degree of reduction; or, what is the same thing, the smaller is equal to the larger divided by the degree of reduction. But this rule is true only when we know exactly where to measure from "in or near" the lens. It is easy to apply it in the case of single and old doublet lenses, measuring from the glass surface or the diaphragm respectively; but, with more modern and complex types of lenses, one would require to find out by special tests from what point to measure forward from lens to original and back from lens to plate. The system of measuring the extra focal distance largely avoids this difficulty, and for that reason I recommend it as a most practical working method. There is no more in it than the two rules I have given in the preceding paragraph; calculations can often be done in the head or, at the worst, on a half-sheet of note-paper. Remember that in all calculations you should imagine two bars, each the focal length (or back focus) of the lens, one sticking out in front of the lens and one behind. This will remind you to add one focal length to each calculated distance of extra extension or distance of original from the lens.

Focal Length and the Studio

The problem of deciding whether a lens is suitable for a studio or room as regards focal length may be worked out by the same easy method. As we have already seen, it is best to use the longest focus which space permits for the sake of better drawing or perspective. The first thing is to find the permissible working space by pushing the camera as far back as it will conveniently go, and measuring the distance from lens-board and sitter. The next thing is to find the degree of reduction. This we do by dividing the height of the sitter by the height of image required on the plate. In the case of a 6-inch cabinet portrait, this degree of reduction will be about 12 for a full-length 6-foot figure: Say, 6 for a half-length or bust, and 3 for a head. Then, to find the greatest focal length which can be used, divide the working distance by the reduc-

tion. The result is rather greater than it should be, because we have not allowed for the one focal length immediately in front of the lens. But it is a quite sufficient guide. Example: For a 6-inch image from an average standing figure, i. e., degree of reduction 12, working space 15 ft., focal length is $15 \div 12 = 1\frac{3}{12}$ ft.= 15 inches. Try 14 inches and calculate back the other way: Space required= $14 + (14 \times 12)$ inches= 182 inches = 15 feet 2 inches, so that 14 inches is just about the longest focus which can be used.

In the same way we can calculate the length of studio for any given class of work with a given lens. Example: Carte (3-inch) portraits of full length (6 feet) sitters with 12-inch lens. Reduction figure is $(6 \times 12) \div 3 = 24$. Therefore camera extension is $12 + (12 \div 24) = 12\frac{1}{2}$ inches. Distance from lens to sitter is $12 + (12 \times 24) = 25$ feet, say 26 feet in all, to which must be added a fair amount of working space behind the camera and for the background.

How Back Focus Serves

A last reference to focal length, viz., to the conditions under which a difference between the focal length and the back focus of a lens will be of service. In the case of a reflex camera, a lens of back focus which is greater than the focal length is of advantage in permitting a shorter focus to be used than would otherwise be possible. Owing to the movement of the mirror in this type of camera, the lens cannot be brought nearer than a certain distance, otherwise the mirror fouls the lens tube. With some types of reflex cameras, this space is such that, with a normal lens a shorter focus than 6 inches cannot be used on a quarter-plate reflex. Some people prefer a lens of not more than 5 inches focus, and are therefore glad to use a lenses such as the "Aldis," the back focus of which is appreciably *longer* than the focal length.

On the other hand, the telephoto lens provides exactly the opposite facility, viz., great focal length with a *short* camera extension. The Ross "Telecentric" lenses, for example, allow of a focus being employed which is somewhere about double the extension of the camera.

Altering Focal Length

When one has only one or two lenses, it is often of advantage to increase or reduce the focal length, as can readily be done by combining the lens with another. To shorten the focus, a positive or converging lens, such as those we have been considering so far, is used. It adds its bending power to lens No. 1, and so brings rays to a focus at a lesser distance. To increase the focal length, a negative or diverging lens is used, i. e., one which causes parallel rays to diverge.

Supplementary Lenses

Such lenses, both positive and negative, are sold as supplementary lenses, under various trade names, as "Planiscopes," etc., and are of focal lengths chosen, as a rule, for altering the focus of lenses supplied with hand-cameras; but it is easy to lengthen or shorten focal length to any extent by using the very cheap circular spectacle glasses obtainable from large general opticians. The extra lens of suitable focal length is combined with our lens proper by fixing the former in the hood, or in an extra cardboard collar which can be slipped on the lens tube, or by some such means.

Rule for Combining Lenses

The rule for finding the focal length produced by combining two lenses in this way is: Multiply the focal lengths together and divide by the sum (of the two) less the distance apart. Thus 10-inch and 6-inch lenses, 1 inch apart, give a focal length of

$$\frac{10 \times 6}{16 - 1} = \frac{60}{15} = 4 \text{ inches}$$

This is a very rough rule, particularly when applied to combining a R R or other doublet lens with a single lens. Moreover, usually we want to use the rule the other way about, so to speak. We want to know what focus we must use to increase or reduce the focal length to a given amount. The rule then is: Multiply the focal length of your lens by the focal length required, and divide by the original focal length less the final focal length. Thus, to reduce an 8-inch lens to 5 inches: $8 \times 5 \div (8-5) = 40 \div 3 = 13$ inches, near enough. If the lens is to be increased in focal length, the calculation is

the same, but a negative lens must be used. In the latter case (and also to a lesser degree in the former) much depends on the position of the added lens. Different positions have to be tried in order to get the best definition on the plate, and thus the rule is quite a rough guide, but some useful indication of what focal length to try at the start.

The Diaphragm

So far we have considered lenses only as regards their focal length, and have perhaps familiarized ourselves with the effect of focal length on the size of the image and, in conjunction with the size of the plate, on the drawing of the image.

Now we must examine the effect of the diaphragm in several practical directions, viz., in determining the "speed" of the lens, the depth of focus, distortion of straight lines in the subject, and the production of other defects such as flare-spot.

Speed of Lens

The amount of light which reaches the plate is conditioned, so far as the lens is concerned, by the size of the diaphragm *relatively to the focal length of the lens.* If the diameter of the diaphragm is one-fourth the focal length, that is a very rapid lens and is designated $f/4$. If the diaphragm divides 6 times unto the focal length the speed of the lens is called $f/6$; if 8 times, $f/8$; if 11 times $f/11$, and so on. These four figures represent the chief classes of lenses as regards speed at their largest aperture. Portrait lenses and large-aperture anastigmats have a speed of about $f/4$; other anastigmats, about $f/6$; R R lenses, $f/8$; and single (landscape) lenses, $f/11$. In addition, there are still cheaper single lenses, also wide-angle lenses, the maximum aperture of which is about $f/16$.

Relative Speeds

I think I can assume that most of my readers are familiar with this speed standard for lenses, as also with the relation between the different f/numbers as regards the exposure required, viz., that exposures need to be in proportion to the squares of the f/numbers. In other words, with $f/8$ the exposure, as compared with $f/4$, is $\frac{8 \times 8}{4 \times 4}$

or 4 times, not the simple $\frac{8}{4}$ proportion. Similarly, $f/16$ requires $\frac{16 \times 16}{4 \times 4}$ (= 16) times the exposure with f 4. To avoid this troublesome calculation, it is usual to make the stops of a lens run in a series, each of which requires double the exposure of that preceding, whilst many lenses in this country are marked on the "Uniform System," according to which $f/4$ is marked 1, and the other stops by numbers 2, 4, 8, etc., indicating the number of times of exposure compared with $f/4$. The following table shows the comparative numbers:

Equivalent f and Uniform System Numbers:

Relative Exposure Required	1	2	4	8	16	32	64	128
f/numbers	4	5.6	8	11.3	16	22.6	32	45.2
U. S. numbers	1	2	4	8	16	32	64	128

Where f/ Numbers Mislead

The f numbers marked on a lens diaphragm-scale do not indicate the speed in all circumstances. This is so only when the lens is being used at practically its normal extension, i. e., in focus on distant objects. If the lens is racked out much beyond this, the real number becomes greater than that marked on the mount in the proportion of the greater extension to the normal extension. Thus an $f/4$ lens of 6-inches focus if used, as when copying, at an extension of 9 inches, has a real f/number $\frac{4 \times 9'}{6} = 6$, i. e., $f/6$, and the exposure required is then more than double. A more direct way of making this allowance in practical work is to increase the exposure in the porportion of the square of the greater extension; or, more conveniently, to use a table of exposures when copying on a reduced or enlarged scale, taking the exposure when copying same size as 1. Such a table is:

Scale of Reproduction—	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{3}{4}$	Same size	$1\frac{1}{2}$	2	3	4	5	6	8
Relative Exposures—	$\frac{1}{2}$	$\frac{2}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{3}{4}$	1	$2\frac{1}{2}$	$1\frac{1}{4}$	4	6	9	12	20

To use it, the camera is fitted with a scale marked with the extension distances corresponding with the various degrees of reduction and enlargement, when using a particular lens. These extension distances can be readily calculated by the rule given in a previous paragraph, "Extra Focal Length."

Also the *f* number marked on the mount of an unsymmetrical doublet lens ceases to have any significance if one or other of the two halves of the lens is used alone. Usually the maker tells us the focal lengths of the separate components of a double lens. The *f* numbers are then found by dividing the diameter of the iris or diaphragm-opening in the various positions separately by the focal length.

Depth of Focus

As we have learned at the outset of this monograph, an object in front of the camera is brought to a focus at a point behind the lens which, for a lens of given focal length, is nearer to or farther from the lens according as the object is farther from or nearer to the camera. If there were no means of overcoming that essential defect of a lens, the making of sharply defined pictures of subjects other than perfectly flat ones would of course be an impossibility. We want "depth of focus" or, as it is better termed, "depth of field," that is to say the simultaneous sharp rendering of near and distant objects on the focusing screen, and the diaphragm is the means of securing this effect. A whole number of THE PHOTO-MINIATURE could be filled with a consideration of this subject of depth, which a mass of discussion and misconception has greatly obscured. I will try to deal with it in the fewest possible words, and as closely as may be in respect to practical work.

Diaphragm and Depth of Field

The basis of depth of field is that the cone of rays forming the image of some one point in the subject has for its base the diameter of the diaphragm and, for its apex, the image point on the focusing screen. For practical purposes that image-point is sufficiently small if it is a disc ("disc of confusion") of diameter from 1-100 to 1–300 of an inch. In other words, we get the impression of a continuous sharp

picture if the whole image is made up of tiny discs, and we can reduce the optical image to a structure of this kind by reducing the size of the diaphragm.

The effect of a small diaphragm, if you will think it out with the aid of one or two diagrams, is to reduce the base of the cone of rays from each point in the subject, and so to narrow the angle of the cone. Thus, in an average position, the focusing screen receives on itself a series of image-discs corresponding with near and distant objects, which image-discs can all fall within a prescribed standard of size if the diaphragm be made small enough. In other words, a narrow-angled cone of rays from diaphragm to plate means depth of field, and for that reason it is argued that depth of field depends solely on the absolute diameter of the diaphragm; in other words, that a ½-inch diaphragm gives the same amount of depth whether fitted to a 3-inch or a 12-inch lens.

And it is quite fair to take this view if it is admitted that we can be content with an inferior standard of definition in a large print as compared with a small one. The reason assigned for this permissible difference is that a large print is looked at farther from the eye, and therefore does not demand the same degree of sharpness as a small one; it looks as sharp when held at the conveniently greater distance. The advocates of this theory of depth tell us that the small print made with a 3-inch lens is (or should be) looked at 3 inches from the eye, whilst the usually larger print for which a 12-inch lens is used is viewed at 12 inches distance.

Against all this is the fact that all prints up to, say 8×10 inches, are looked at about the same distance of 10 inches away, or are even examined more closely; and therefore it is necessary to take into account not only the size of the diaphragm, but the focal length of the lens. Thus, when our aim is an equal degree of definition in prints, large and small, focal length steps in as a factor. It becomes necessary to use a smaller diaphragm, the greater the focal length. Students find depth difficult to understand until they realize that its rules and formulas do not represent actual laws of nature, but are only conventions of service in guiding

us to some particular kind of result. They differ from the optical rules we have so far been considering very much as a cook's recipe for a pudding differs from the formula of a true chemical compound. The one can be varied at discretion; the other is part of the system of nature and therefore unalterable.

Depth Facts Still a few broad facts in regard to depth may be stated as following from the general rule that depth is conditioned by the size of the diaphragm. It will be clear to us that great depth is not inconsistent with high speed (i. e., large relative aperture) of a lens. It all depends on the focal length we are using. The diaphragm of an $f/4.5$ lens of 3-inch focus, such as is fitted to a vest-pocket camera, is quite small, and gives great depth at the same time as speed; the same size of diaphragm in a 12-inch lens will also give considerable depth, but the speed of the lens will be only a sixteenth, something like $f/16$, instead of $f/4.5$. That very practical fact was recognized many years ago by the late Piazzi Smyth, whose prophecy of an all-in-focus but non-focusing camera at pill-box size has been realized to a large extent in the vest-pocket cameras of today. No. 125 of The Photo-Miniature on these cameras has given a remarkable proof of the great depth of focus possessed by such lenses, and the optical side of this question is fully discussed therein.

A further practical outcome from our diaphragm theory of depth is the very limited use of a long-focus large-aperture lens. Such a lens must necessarily have a large diaphragm, and therefore very small depth. While it is useful when the subject is all at a considerable distance, as in photographing a distant monument, obtaining large-scale pictures of animals, etc., for ordinary work it is impossible to obtain foreground and distance in focus without much stopping down. Hence, with lenses of focus 12 inches and upward, it is often a pure waste of money to buy one of $f/4.5$ aperture. The largest aperture which can be used in such cases is usually $f/8$, often much smaller, and an $f/8$ lens will be a third or a quarter the price.

Depth Calculations

It would lead us too far to attempt to deal with all the calculations of which depth of field is susceptible. Moreover it would be an unprofitable task, for the practical utility of such calculations is greatly diminished by the fact that they leave out of account the widely different properties of actual lenses. Lenses have not the perfectly flat field and the absolute freedom from faults which these depth formulas assume.

On the contrary, the field of a lens is often saucer-shaped; even that of an anastigmat has its shallow mounds and depressions, and often the quality of the definition is inferior toward the margins. As we use actual lenses and form our pictures all over the plate, most depth calculations are too far removed from practical conditions to be of any service.

Hyperfocal Distance

But there is one figure indicating depth which it is useful to be able to calculate, since it is of some service in hand-camera photography, or in designing any camera for focusing by scale. Suppose that with a lens of given focal length, say 4 inches, used with a given relative aperture, say *f*/15, you focus sharply on the extreme distance, i. e., on some object sending parallel rays, what is the distance of the nearest object which will be rendered according to some standard of sharpness, say 1-100 of an inch? This distance is the "hyperfocal distance." It is the distance beyond which all is in focus when the lens is focused on infinity. The formula for it can be easily shown from first principles to be

$$\frac{\text{focal length} \times \text{diameter of stop}}{\text{diameter of disc of confusion}}$$

This can be converted into a handier form by remembering that the diameter of a stop is equal to the focal length of the lens divided by the *f*/number. The formula thus becomes

$$\frac{\text{focal length} \times \text{focal length}}{\text{working } f/\text{number} \times \text{diameter of disc of confusion}}$$

Taking 1-100 of an inch as the standard of sharpness or permissible disc of confusion, our example is

$$\frac{4 \times 4}{16 \times \frac{1}{100}} = 100 \text{ inches} = 8 \text{ feet } 4 \text{ inches.}$$

This formula shows us that the hyper-focal distance is greater, the longer the focus of a lens; and becomes smaller as the lens is stopped down. With a 5-inch lens at $f/8$, it is 26 feet; with the same lens at $f/16$, 13 feet; with the same lens at $f/5.6$, 36 feet, and so on.

Fixed Focus

This leads me to that queer expression which has become current, viz., "fixed focus." I don't know who coined it; probably some adroit maker of cameras who desired to lead the public to think there was some special merit in a camera without a focusing movement. "Fixed focus" simply means the use of a diaphragm of small diameter, so that great depth of focus is obtained. Usually it is a diaphragm of less than half an inch diameter, with which fairly sharp images of objects both quite distant and near are obtained. The worst of it is that such a diaphragm means a poor speed of lens unless the latter is of very short focus. A half-inch diaphragm, with a 3-inch lens, is about $f/6$, which is fairly fast; but it is only $f/10$ with a 5-inch lens, and with many fixed-focus cameras a still smaller diaphragm is chosen, in order to improve the covering power. In other words, fixed focus is a good system for lenses up to 4 inches focal length, but a poor substitute for a focusing scale with focal lengths much over that. Calculation of the hyperfocal distance (from focal length and f/number as shown above) will give an idea of the nearness to the camera which objects can have without coming out unsharp in the negatives, made in a fixed-focus camera.

Selective Focusing

And here I must say a word connected with depth of focus which is of practical significance, though only indirectly applying to the lens. It is simply to remind the reader of the valuable aid which the adjustment of the camera-back affords in securing uniformly sharp focus of both

near and distant objects even without stopping down. By tilting the plate forward or backward (swing back), or by placing it obliquely to the straight line through the center of the lens (side swing), it is possible with very many subjects to obtain sharp focus of planes of the subject which are at very different distances from the camera. The ease with which this can be done depends on the grouping of such planes in the subject. An example will explain what I mean. Imagine we are photographing a somewhat distant house from a point of view immediately behind a flower-bed in the garden. The details of plants will be greatly out of focus if focus is obtained on the house. But, if the upper part of the plate be caused to recede from the lens by swinging the back in this direction, the immediate foreground will come into sharp focus with comparatively little stopping down. The expedient may be applied in endless ways and is often of the greatest service when the movement of the subject by wind or from figures in it makes it necessary to use as large a stop as possible.

Distortion of the Diaphragm

There is a third effect of the diaphragm which is of much smaller importance, since it is produced only with a single lens. With such landscape lens, the diaphragm is usually in front, and cuts off the rays coming from the subject at various angles in a way which causes the edges of the image to be formed by the edges of the lens, and the center of the image by the center of the lens. Thus a straight line near the margin of the picture is bowed inward at each end, acquiring a barrel outline. If the line falls in the middle of the image, i. e., opposite the center of the lens, there is none of this effect; the bowing becomes more pronounced as the margins of the field are used. This distortion, when full on the margin of the field of a properly designed landscape lens, is not great; it amounts to a bowing in at each end of a 6-inch line in the negative of less than $\frac{1}{16}$ of an inch; though that is quite enough to show plainly in the case of a subject like the straight edge of a house-side.

It means that a single lens is not suitable for subjects containing straight lines when those lines fall

near the edge of the plate. That, however, is not to bar single lenses even for straight-line subjects. Such a lens is quite good if you are careful to use one of long focus in relation to the plate, e. g., a 14- or 16-inch lens on a 4 x 5 plate, and to keep the lens fairly opposite the center of the plate. You then use only the central part of the field. These single lenses are such admirable instruments (on account of the brilliancy of the image), and are now sold second-hand at such low figures, that it is worth while bearing them in mind for work which does not call for a larger aperture than $f/11$.

If the diaphragm is behind the lens, the distortion is opposite in kind, i. e., pushed out at the ends of a marginal line in pincushion shape. Hence the doublet or rectilinear lens, in which the barrel distortion of the back component and the pincushion distortion of the front lens are simultaneously neutralized by the diaphragm placed between the two glasses. It doesn't follow that every doublet lens is altogether free from this line-bowing. The optician endeavors to make it so, and with most R R's such distortion is practically nil.

Flare-Spot This defect or aberration may take several forms, usually either a hazy patch of fog in the center of the negative or a less clearly defined patch or ring, occurring on the side of the plate opposite to the image of some light object. As a rule, the flare spot is an image of the diaphragm-aperture, due to light-rays reflected from some surface of the lens, and is a result of the diaphragm in the sense that adjustment of the position of the diaphragm will usually remove it. The precise cause of flare is a complex subject, and it would take us too far to explore it fully. We must be content to describe a test by which it can be readily detected. Place the lens centrally on the camera front and, in a dark room, focus sharply on an electric-lamp filament or gas mantle about ten feet away, using a diaphragm or stop about $f/16$. If there is flare, a halo will be seen around the image of the bright object in the center of the screen. If then the camera be turned slightly, the halo will move to one side of the center, as the image

moves to the other. A smaller stop will reduce the general illumination on the plate, whilst the flare-spot retains its original intensity and so appears more pronounced. This is a delicate test for flare, and one need not condemn a lens which shows slight flare under it. With single or R R lenses, the flare can be removed, in some cases by screwing out the lens (or lenses) in its (or their) tube; in others by shortening the lens tube. Anastigmats, as a rule, cannot be tampered with in this way. In either case, the mechanical work is of a kind which calls for an optician.

The Field of a Lens

So far we have been considering properties which, broadly, are common to all lenses good or bad. It is when we come to the field of a lens, i. e., the full area covered by the image, that we have to draw distinctions, and, in doing this to consider the field in two or, say, three respects. These are covering power or area of field in regard to focal length and speed, flatness of field, and fineness of definition.

Covering Power

The field of a lens is circular, and is limited by the construction of the lens itself and, sometimes, by the form of the tube or shutter in which the lens is mounted. Most of us use a camera the plate of which is fully covered by the lens, and so do not learn much about the covering power of the lens, as we should do by trying the lens on a much larger camera. Then, we should see, perhaps, that the lens covers barely more than the plate it is tested for. Beyond the circle within which that plate just falls, the definition falls off or ceases altogether, the focusing screen appearing dark.

In the latter case, the lens does not illuminate the larger area. On the other hand, another lens will cover a much larger disc than that including the plate without the image showing signs of fuzziness or "woolly" definition toward the margins. Some lenses, such as many R R's and anastigmats, will cover a much larger disc by using a smaller stop; with others, such as the portrait type, hardly any increase of covering power is obtained by stopping down. Usually a lens which is made to work at a large aperture ($f/4.5$) has

not such good extra covering when stopped down to $f/6$ or $f/8$ as has a lens of the same class with $f/6$ or $f/8$ as its maximum aperture. The optician generally has to sacrifice something to get the normal covering power at the large aperture.

Normal and Extra Covering Power

Extra covering power may be a necessity or a positive drawback, according to circumstances. Apart from covering the plate when the lens is central, we often need to cover it just as well when the lens is raised on its board, and hence require the greatest covering power, often at the largest aperture practicable.

But it must be remembered that a lens of this large covering power has its power *all the time*, and if a large plate is not presented to it, the margins of its field fall upon and light up the inside of the camera. Some of that light is scattered on to the plate, and tends to veil the negative. Hence, with a camera without much use of front, such as many focal-plane types, great covering power of the lens is no advantage, but the reverse to an appreciable extent. By trying a lens on a big camera, it is easy to see at a glance what its field is like. It is on account of this scatter of light from even the blackest of camera interiors that a lens the field of which falls sharply off altogether, such as a portrait lens and some anastigmats, is preferred for copying drawings, etc., where veiling is badly felt. A camera several sizes larger than that for the plate serves the same purpose, the whole image then falling at the end facing the lens without reflection of light.

Flatness of Field

Equally, lenses differ in the degree to which the image of a flat object coincides with the flat focusing screen or plate. It is in this respect that the anastigmats are markedly superior to the old R R's and single lenses, the fields of which, over which sharp definition of a flat object are obtained, are not flat but saucer-shaped, with the concave side toward the lens. For plan-copying and such work the anastigmat is certainly much the better instrument, yet not to the extent it might be thought, since copyists can just as conveniently use a

long-focus R R lens, utilizing only the central flat part of the field. On the other hand, there are plenty of subjects for which a lens with a concave field is really better than one with a flat field. A portrait photographer who knows what the curvature of the field of his lens is like can often turn it to advantage, and get near or distant parts sharp whilst using a larger aperture. The reason is that, in order to form a sharp image on the focusing screen, the rays from the nearer foreground part of the subject, such as knees or arms, meet not in the true field of the lens (for a flat subject), but a little way behind it.

Fineness of Definition

It is difficult to say much of practical utility on this property of a lens, important as it is in determining the "quality" of an objective. It signifies the ability of the lens to give a brilliant image of the utmost sharpness on the focusing screen and in the plate. It depends on the degree to which the optician, by his choice of glasses and curves, succeeds in eliminating the various aberrations from which a simple lens of one piece of glass greatly suffers. Those aberrations arise from distinct causes, so that the reduction of one often involves the increase of another.

The science of the optician, as embodied with such success in the modern lenses, consists in getting rid of all these aberrations at once over a considerable and flat field, and at the same time retaining a large working aperture. That is what is done in many *f*/4.5 anastigmats. It is done to a supreme degree by the portrait lens over its narrow angle of field. In lenses of smaller aperture (*f*/8 to *f*/16) the problem to be solved by the optician is simpler, and a small stop of *f* 32 removes most of the faults to which a lens is liable. It would be easy to fill pages on the separate effects of these faults, but the really important thing is to be able to make a test to show the performance of a lens in practice as regard rendering fine definition over a given area. To do this, as good a plan as any is to place quite square with the lens, and some 15 or 20 focal lengths away, a sheet of small-type printed matter of size sufficient to fill the plate with its detail. Focus

with the utmost care (with a magnifier) in the center of the plate, and make a negative on a slow, fine-grained landscape or transparency plate. The negative, examined with a magnifier, will show where definition begins to fall off toward the outside edges of the plate. Though not in any sense a scientific test, it does give a fairly good idea of what the lens will do.

It may be helpful to the novice if we briefly consider the principal defects or aberrations which the lens-maker has to correct before the objective will measure up to the standard required for photographic use.

Spherical Aberration

Spherical aberration, so called because it proceeds from the form or shape of the lens, is positive or negative in character according to the shape of the lens. In a photographic (convergent) lens, it is defined as the inability of the lens to bring to a precise point both the central and marginal rays of the same pencil of light. Properly speaking, the term refers only to direct rays—those which form the central portion of the picture-image. When oblique rays are considered, the error is known as zonal aberration, or coma. In all its forms it results in indistinct, diffused image points—really discs instead of precise points. Sharp definition is impossible with a lens in which this error has not been corrected at least in some measure. This is usually effected by combining positive and negative lenses of such refractive powers that the error of the negative lens counterbalances the opposite error of the positive. The amount of spherical error remaining in a lens which has been partially corrected in this way can be further reduced by placing in front of the lens a "stop" or diaphragm with an aperture smaller than the full diameter of the lens itself, thus cutting off the marginal rays which cause the trouble, and permitting only the central or direct axial rays to pass to the image field. This, of course, means that we are using only part of the light reaching the first surface of the lens in the formation of the image, with a consequent loss of rapidity. Thus the single lenses supplied in the cheaper sorts of hand-cameras are only roughly corrected for spherical and

other errors, their defining capacity depending on the use of diaphragms with small apertures.

Chromatic Aberration

Chromatic aberration is the inability of the lens to converge a ray of white light reflected from a luminous point to a corresponding point of white light in the image, due to the dispersion or separation by the lens of the several color-rays making up the white ray. This dispersion of the color-rays causes them, when converged, to meet at different distances from the lens instead of in a precise point. The error is corrected by combining positive and negative lenses of different dispersive powers, so that the negative aberration of the one destroys the positive aberration of the other. All photographic lenses are corrected so that the yellow (visual) and blue-violet (chemical) rays will meet in a precise point. Lenses thus corrected for two colors are described as achromatic; when corrected for three or more colors, as is necessary in three-color and reproduction work, they are described as apochromatic. A lens which is corrected for spherical and chromatic aberration is said to be *aplanatic*, a term now rarely used.

Curvature of Field

Hitherto we have assumed that the lens brings its image to a focus in a plane, such as the ground-glass focusing screen or sensitive plate. As a matter of fact, however, the focal surface is a curved field instead of a plane, so that to obtain a sharply defined image of a flat object, such as a series of circles drawn upon a wall or any other flat design, the sensitive plate should be concave or saucer-shaped in form. This inability of the lens to give a sharply defined image on a flat field is due to the aberration of form known as curvature of field. All lenses except anastigmats have this error. Its correction is important in lenses used in copying or in photographing objects in low relief, or groups where the figures are arranged in straight lines. It can be reduced by the use of a diaphragm with a small aperture or by combining a slightly concave (divergent) lens with the positive. The best anastigmats are quite free from this error, and so are described as possessing "a perfectly flat field," for which reason these lenses are preferred for copying.

Distortion The aberration known as curvilinear or marginal distortion is due to the varying thicknesses of the lens, and expresses its inability to reproduce straight lines in the object as straight lines in the image. It exists in all single lenses with two or three exceptions, the kind of distortion varying according to the position of the stop or diaphragm. When the diaphragm is fixed in front of the lens the distortion is "barrel-shaped," so that marginal lines are represented as curved outward at the middle. With the diaphragm behind the lens the distortion is of the "pin-cushion" shape, marginal lines appearing as curved in the middle. This defect renders the single lens useless for architectural or other work where straight lines play a prominent part. It is corrected by combining two lenses with similar but opposite errors and placing the stop or diaphragm midway between them, so that the distortion produced by the one is corrected by the opposite distortion of the other. Lenses so corrected to reproduce straight lines as straight lines are known as "rectilinear" or "doublet" or orthoscopic lenses.

Astigmatism Astigmatism is the most widely advertised and least clearly understood of lens aberrations. It expresses the inability of the lens to give at or near the margins of the field an image of an object containing vertical and horizontal lines in which both lines are sharply defined at the same time. It refers only to the bundles of rays which pass through the lens obliquely to its axis and affects the marginal definition of the picture-image. Thus, where this error exists in a lens, the image-bearing rays reaching the lens obliquely are converged to two blurred lines at right angles to each other instead of a precise point. For example: If we set up a card inscribed with a boldly printed plus sign and attempt to focus the sign with a lens in which this error has not been corrected, we may get both vertical and horizontal lines sharpiy defined at the same time in the center of the screen; but as we move the camera so that the image travels from the center to the edges of the screen, one or other of the lines will assume a blurred ellipsoidal form. Hence

the practical result of astigmatism in a lens is a lack of sharp definition in the marginal portions of the photograph, which destroys the usefulness of the lens for architectural photography, copying or other branches of work where critical definition over the whole field combined with rapidity are essential to success. The correction of astigmatism is effected by ingenious combinations of various kinds of glass possessing different powers of refraction and dispersion, and arrangements of curves and thicknesses made possible by the many varieties of optical glass placed at the service of lens-makers by the researches of Abbe and Schott, at Jena, during the early eighties. Lenses in which this error is corrected, and which are therefore capable of reproducing marginal points in an object as points in the image, are called anastigmats, orthostigmats, verastigmats, plastigmats, or simply stigmats, the basic word *stigma* meaning "a point," *astigmatic* meaning "without a point," and *anastigmat* meaning "back again to a point." Apart from this real significance, however, an anastigmat is generally understood to mean a lens in which all the five or six principal errors or aberrations are largely or wholly corrected, so that it will give a sharply defined image with a flat field within a comparatively large angle when used at a large aperture. Thus the correction of astigmatism is seen to be a great advance in the attempt to combine defining power and rapidity in the lens.

Lenses Classified

Turning now to the trade catalogues, we find lenses described under many different names, and the prices seem to differ as variously as the names. Let us classify them according to their capacities.

Single Lenses

I: Single lenses, otherwise called single achromatic, meniscus, achromatic meniscus lenses, are nowadays usually sold as irremovable parts of the inexpensive hand-cameras to which they are fitted. They are also sold separately, for use in combination with other lenses, as "supplementary" lenses under various trade names, as already mentioned in an earlier paragraph on "Supplementary Lenses." They are made up of two

simple positive and negative lenses cemented together, chromatic and spherical aberration being thus at least partially corrected. With this correction and the further help of the small diaphragm apertures with which they are fitted, these single lenses are capable of very good work within a limited scope. The necessary use of small apertures, rarely larger than *f*/16—one-sixteenth of the focal length of the lens—makes them slow, so that successful work with them depends upon favorable conditions, such as fairly distant subjects, sunlight days out-of-doors, or subjects without movement such as landscapes, where critical definition over the whole field is not necessary, etc. Similarly, since single lenses are not corrected for distortion, they cannot be used in photographing buildings, copying, or subjects with prominent lines near the margins of the field, as such lines will be represented as curved in the picture. Apart from these disadvantages, the single lens properly understood and used with discretion has its peculiar good points for certain kinds of work, such as pictorial landscape, wherein its "depth" (due to its small aperture) and softly diffused definition (due to the amount of spherical aberration left uncorrected) are especially desirable. The really excellent work produced with the cheap hand-cameras fitted with these single lenses offers further proof of their usefulness. For purely pictorial work the single lens will give results wholly pleasing.

Commercial Supplementary Lenses

The single lenses sold as "supplementary" lenses are simply achromatic positive or negative elements of different focal lengths, which, when used with the lens already fitted to the camera, diminish or increase the focus of the original lens, and so enable the user to get larger images of distant objects, or to photograph objects nearer to the camera than was possible before, or add to the covering power of the lens so that it will cover a larger plate as a "wide-angle" lens. These "supplementary" lenses come in "sets," each lens being marked with its proper use, so that no abstruse calculations are needed. In Europe the use of simple, non-achromatic spectacle lenses as "supple-

mentary" lenses or "magnifiers" is more common than on this side of the Atlantic. They offer a wider range of possibilities than the "cut-and-dried" sets, but require individual calculation in their adaptation for practical use.

Single Anastigmats

Mention should be made here of the fact that the introduction of new kinds of Jena glass has made possible the construction of single lenses practically rectilinear and anastigmatically corrected to give sharply defined images over a flat field with the comparatively large aperture of *f*/12. These remarkable lenses, of which the Zeiss Series VII is perhaps the best known example, have been evolved in the construction of the Convertible Anastigmats introduced by Zeiss under the name Double Protar VIIa. See further in the paragraph under "Anastigmats."

Rectilinears

II: Rectilinear lenses, formerly known as "doublets," but also variously described as rapid rectilinears, symmetricals, double symmetricals, aplanatic, convertible, rectigraphic or tri-focal lenses, according to their make-up, are usually composed of two single lenses mounted in a tube at some little distance apart with the diaphragm or stop midway between them. This construction permits the elimination of the error of distortion and the better correction of spherical aberration, also allowing the use of larger diaphragm apertures, so that the rectilinear represents an advance over the single lens in defining power and rapidity. Thus the average rectilinear is usually listed to cover the plate for which it is made at *f*/8, theoretically four times as rapid as the single lens at *f*/16, but practically eight times more rapid, since the latter would have to be "stopped down" to *f*/22 to define the image equally well over the same area. Until the advent of Jena glass and the anastigmat, the rectilinear represented the highest achievement among lenses for general uses, and it is still quite good enough for 80 per cent of the work of the photographer, provided that he does not want to attempt high-speed work, three-color or fine reproduction or scientific photography.

Symmetricals When composed of two single lenses of approximately the same focal length, the rectilinear is known as symmetrical and combines two lenses,—the double objective (or lens used as a whole) and the rear element used alone as a single lens, in which case the single element will have twice the focal length of the doublet or whole lens. When a single element of an objective is used in this way, its rapidity is diminished by the necessity for the use of smaller diaphragm apertures—about which see the earlier paragraphs on the use of the diaphragm.

Convertible: Tri-focal Rectilinears made up of single lenses of different focal lengths are sometimes spoken of as unsymmetrical doublets. When these are so constructed that the single elements can be used separately, we have what is known as a convertible or three-focus or "tri-focal" lens. This simply means that the objective is made up of two corrected lenses of different focal lengths, either of which may be used as a separate lens, so that the objective embodies three lenses and a choice of three different focal lengths. The Ilex Rapid Convertible is a favorable example of this class of lenses.

Lens Sets This evolution of the tri-focal or convertible lens led to the introduction of "lens sets." These usually comprise a tube or exposure shutter with from three to seven achromatic elements which, by various combinations, according to directions accompanying the "set," provide from six to fifteen different lenses adapted for various purposes. In the cheaper "sets" the correction of the lenses is indifferent, so that the various combinations are slow and give soft rather than sharply defined images. The Anastigmat "sets," however, are more carefully corrected and give results which justify the higher prices asked for them. To sum up, then, for all ordinary purposes where critical definition from the center to the edges of the plate and rapidity are not essential, the rectilinear of today, with a rapidity expressed by an aperture of $f/8$, is as good a lens as the amateur can desire. In every-day work out-of-doors or indoors, its lack of complete correction will

often prove advantageous, giving softer definition at the edges of the picture-image, a better separation of the planes of the picture field and greater "depth."

On the other hand, when subjects including rapid movement are in question, as in focal-plane photography, or where we may be required to get good negatives of difficult subjects on dull days under unfavorable conditions of illumination, for portraiture indoors, nature subjects, animal photography, three-color reproduction and scientific work of all kinds, we can best ensure success by using a lens which by its more perfect correction will give us every possible advantage in defining power and rapidity. This we have in the anastigmat, which, plainly put, is simply the highest type of the rectilinear at present available.

Anastigmats

III: Anastigmats differ in form and name so variously with each maker that it is difficult to group or classify them in any way which will help us in an intelligent estimate of their qualities. This is best accounted for by the fact that the many varieties of optical glass now available provide many different ways of attaining the same end. The result of this was seen as soon as the first anastigmats were introduced; other opticians quickly perceived that the new glasses offered other ways of attaining the same superior correction, and soon after there were as many different anastigmats as there were different makers. The same procedure followed the introduction of each new form of anastigmat by any maker, and this duplication has been further stimulated by competition, so that today the photographer is fairly bewildered by the variety of anastigmats from which he has to make choice for his purpose.

Points of Choice

Taking them, for the moment, as equal in general excellence (which they are not), the following three points are worthy of note in the choice of a particular lens from the many offered in the trade catalogues: (1) Covering power: In some anastigmats this decreases when the diaphragm is changed to a small aperture. This is not desirable. With many subjects it is desirable to be able to focus with a large aperture and then use a smaller

aperture to get more "depth" or to regulate the exposure. (2) Initial rapidity: Other things being equal, it is better to choose a lens which will work at *f*/5.6 than as *f*/7 or *f*/8, simply because the first is twice as rapid as the last, requiring only half the exposure. (3) Some anastigmats can be used only in their complete form; others are convertible, i. e., their elements can be used separately, this affording two or three lenses of different focal lengths according to whether the complete lens is symmetrical or unsymmetrical in character. Other things being equal, and more especially if there is no sacrifice in the rapidity of the complete lens, the unsymmetrical convertible form offers the widest possibilities of usefulness. Another point, already mentioned, should not be overlooked, viz., that of two lenses equal in rapidity and defining power, the one which defines the larger angle (greater width of image) is the better one. Apart from these general points, with anastigmats as with other lenses, the choice of a lens depends most largely upon the work for which it is required. From all that has been said, the reader will have grasped the fact that no one lens can do all things equally well and that every lens represents a compromise.

Universal Lenses

Lenses in the make-up of which special or particular abilities have been in some measure sacrificed to secure general all-round capacity are sometimes catalogued as "universal" lenses. The Goerz Dagor (Series III, *f*/6.8), the Collinear (Series III, *f*/6.8), the Ilex Anastigmat *f*/6.3; the Ross Combinable Lens; and the Bausch & Lomb-Zeiss Tessar Ic *f*/4.5 belong to this class. All these offer a remarkable range of usefulness and leave little to be desired for all-round, every-day work with the hand- or stand-camera. Where price is not considered, however, the convertible anastigmat is undoubtedly the highest type of "universal" lens, since, by having three or four elements of different focal lengths, we can ourselves make up an objective to meet almost any possible requirement. The Zeiss Protar Series VIIa is a good example of this "convertible" class.

Special Lenses

Coming now to special lenses, we find in the catalogues mention made of wide-angle, portrait, telephotographic and process lenses. When properly listed under these names, these lenses are designed for special branches of work, and it may be assumed, as a general thing, that some other quality has been sacrificed where necessary, to give the lens special ability in its particular field. The wide-angle lens has already been mentioned in earlier pages. Process lenses do not come within the scope of this monograph, and so will be passed over without detailed consideration.

Portrait Lenses

Lenses especially designed for portraiture belong to a special class. In the construction of such lenses, everything is sacrificed to secure great rapidity with sharp definition within a very limited field. Thus we have portrait lenses listed as working at apertures of *f*/2.2, *f*/4, *f*/5, *f*/6; a lens working at *f*/2 being four times as fast as one working at *f*/4, six times as fast as an *f*/5, and nine times as fast as an *f*/6. Such lenses necessarily have very little depth of definition when used at full aperture and, when smaller diaphragm apertures are used to give greater depth, the loss of rapidity is generally accompanied by other disadvantages. The field of a portrait lens is extremely curved, and its defining power fails rapidly from the center of the field. For these and other reasons, such as its limited usefulness and great cost, the special portrait lens is rapidly being displaced by the anastigmat, which will do equally well all that the specially designed portrait lens can do and has a much wider field of usefulness, because of its better correction. Of anastigmat portrait lenses the Zeiss Portrait Unar, Series Ib, is a notable example, combining the good qualities of the anastigmat with the ability to secure softness, roundness and gradation, these latter being controlled by an adjustment fitted to the front lens by which its elements may be separated or brought closer together at will, this adjustment permitting any amount of diffusion of definition desired. The Heliar, the Goerz Celor, and the Bausch & Lomb Portrait Unar, and the Ross

Xpres also belong to this class. Among old-style portrait lenses, those of Dallmeyer, Ross, Bausch & Lomb and Voigtlander still retain their preëminence, although of late years the market has been flooded with less expensive lenses designed for portrait and group work. In purchasing a lens from this last class as a matter of economy, the buyer should satisfy himself by practical test that the lens has the qualities required for the work it is to do. Special Achromatic-Meniscus Portrait lenses for amateurs, giving softly diffused images, are offered by various makers, the Verito, Struss Pictorial lens and Pinkham and Smith Achromatic being familiar examples.

Telephoto Lenses

V: The telephotographic lens is an objective or lens system of somewhat complex construction, designed to give larger images of distant objects than can be obtained with an ordinary photographic lens. The peculiar properties which make it preëminent in this special branch of work also make it useful in animal photography, portraiture, and other special applications of photography. As a detailed explanation of the lens and its uses would fill a volume of goodly size, the reader desiring a comprehensive account of these is referred to such works as *Telephotography*, by Lan Davis; Wheeler's *Modern Telephotography* and Marriage's *Elementary Telephotography*, wherein the subject is dealt with at length. The following summary will probably suffice for many of my readers.

Size of Image

The size of the image of an object depends upon: (1) the distance of the object from the lens, and (2) the focal lengths of the lens used in making the photograph (which, roughly speaking, is the distance between the diaphragm of the lens and the focusing screen when a distant object is focused on the screen). We can therefore vary the size of the image, or scale of our reproduction of an object, either by photographing it from different distances, or by the use of lenses of different focal lengths. Where it is impossible, difficult or undesirable to alter the distance from which the object is to be photographed, then we can vary the size of the

image only by using lenses of different focal lengths. The rule here is that of an object at a given distance, the longer the focal lengths of the lens, the larger is the image obtained. And, of course, whatever the focal length of the lens, the bellows-extension capacity of the camera must be sufficient to allow of the separation of lens and plate necessary to give a properly focused image. So that the getting of large images of distant objects ordinarily involves the use of large, unwieldy lenses of great focal length and cameras with unusual bellows capacity.

Tele Combinations

The telephotographic lens system, made up of a combination in one tube of an ordinary photographic lens with a special negative (magnifying) lens, gives all the advantages of a long-focus lens without the need of a corresponding increase of bellows extension. Thus the telephotographic lens is lighter, less bulky and less costly than an ordinary lens of the same focal length and will give larger images of distant objects with small cameras with short bellows extension than can be obtained by any other method. Telephoto lenses are sold as complete instruments (an ordinary or positive objective combined with a negative element, mounted in a tube fitted with rack-and-pinion movement or in an adjustable tube permitting the required separation of the lenses); or simply in the form of telephoto attachments (an achromatic negative lens mounted in a tube with rack and pinion, the tube being threaded to receive an ordinary photographic lens). The latter form is generally preferred, as the attachment can be removed at will, leaving the positive lens unaltered for every-day work. The separation of the positive and negative elements by means of the rack-and-pinion movement varies the focal length of the system, so that the telephoto lens is really a long-focus lens of variable focal length. The degree of the magnification or enlargement of the image depends upon the separation of the two elements, the magnification being greater as the two elements are brought closer together. By various combinations of negative and positive elements of different focal lengths and suitable bellows extension, a telephoto

system is obtained, giving a definite range of magnifications according to the requirements of the individual worker. Tele-negative lenses or telephoto (complete) objectives are supplied by almost all the principal lens makers, the Bausch & Lomb Company and the Goerz Optical Co. offering inexpensive tele attachments specially designed for hand-camera work.

Choosing a Lens

With the information thus far given regarding the different types of lenses and the properties they possess, the reader should find little real difficulty in the selection of a lens to meet his individual requirements, or in the more intelligent use of such lenses as he may already possess. Of course, no one lens can be expected to do all kinds of things equally well. Different branches of photographic work call for different lens qualities, and, as we have seen, it is not possible to combine in one lens all the capacities needed for widely differing classes of subjects. A glance over these varying requirements in different branches of work may be useful.

Hand-Camera Lenses

For general hand-camera work the qualities chiefly required in the lens are defining power, covering power, depth of field and rapidity. Taking the last first, for all work where the exposures will range from $\frac{1}{5}$ to $\frac{1}{100}$ of a second, a lens working at *f*/11 will serve under favorable light conditions, but *f*/8 will give wider possibilities of success in dull weather, or with different classes of subjects, being sufficiently rapid to allow of movement in the view if this is not too rapid and the object not too near the camera. For subjects including rapid movement, or requiring exposures ranging from $\frac{1}{100}$ to $\frac{1}{1000}$ of a second or higher, an anastigmat working at *f*/6 should be chosen, but for the fastest instantaneous work, with focal-plane shutters, where every possible advantage must be had, then a lens working at *f*/5.6 or *f*/4.5 is preferable. Since depth of field is very desirable in hand-camera work and yet cannot be combined with rapidity, we can compromise to advantage by the choice of a lens combining great covering power with short focal length, remembering that a short-focus lens gives greater depth than another of the same rapidity

but longer focus. The short-focus lens will also give a wider view-angle, which is often desirable in hand-camera work. The focal lengths advised for hand-camera lenses are: for pictures $3\frac{1}{4} \times 4\frac{1}{4}$, about $4\frac{1}{2}$ inches; for 4×5, about 6 inches; for 5×7, $7\frac{1}{2}$ inches. When pictorial photography, or figure or nature studies with the hand-camera are in question, however, these focal lengths will be too short to produce the most pleasing results, and lenses of greater focal length should be chosen. As mentioned on an earlier page, the best way to solve the hand-camera lens question is to know the extension capacity of the camera and then purchase that particular convertible two or three foci anastigmat which offers the largest possibilities in the way of different focal lengths and rapidities. If the limited extension of the camera does not permit this, then the special forms of anastigmats sold in cells ready for simple adjustment to the exposure shutter fitted to the camera offer a happy solution of the difficulty.

Outdoor Work

For outdoor photography of the average sort, which does not include rapidly moving objects or subjects requiring critical definition combined with rapidity, the rectilinear lens with a speed of *f*/8 has all the qualities needed for successful work. It shows its qualities best if stopped down to *f*/11 or *f*/16, and should not be used at its full aperture save under poor light conditions or when the subject includes movement. Correctly speaking, the rectilinear is inferior to the anastigmat only in its speed and marginal definition, the anastigmat being simply a more perfectly corrected rectilinear and not a separate or special type. Hence, where speed and marginal definition are not essential to success, the amateur can save money without sacrificing any desirable quality by buying a rectilinear and leaving the anastigmat for those who need the peculiar qualities in which it is supreme. The focal length of a rectilinear for general purposes should be about one-third longer than the longest way of the plate, but if much work is to be done in cities, where it is not always possible to get far enough from the subject, the focal length can be shorter, although it should always exceed the longest

dimension of the plate used. For commercial work, where definition is generally imperative and rapidity a desirable factor, the anastigmat is preferable to the rectilinear for reasons already made plain. For outdoor sports of all kinds, groups and similar subjects, also, the anastigmat, with its greater speed and better covering power, gives advantages which it would be folly to despise. In copying and enlarging, too, the anastigmat leads because of its superior defining power.

Interiors: Buildings

For interior work and architectural photography we want angle of view, covering power and freedom from distortion, rapidity being of lesser importance. The angle of view included by a lens, as we know, is determined by the focal length of the lens in relation to the base line of the plate used. The shorter the focal length of the lens, the larger is the angle of view it will give on a plate of given size. Hence, we use wide-angle lenses most largely in this class of work, where it is often impossible to get far enough from the subject to permit the use of a lens of normal focal length. Since, however, the use of too short focus lenses gives violet perspectives, this should be avoided and a lens of normal focal length employed wherever possible. Covering power is essential because this class of work often calls for the use of the rising and falling front, the swing-back, etc. Unless the lens is capable of covering a much larger plate than that used with it, this will result in dark corners and imperfect illumination.

With this our survey of the lens in action must be brought to an end. By the omission of diagrams and illustrations, I have compressed more lens facts into this little handbook than can be found in any work of similar scope, and the reader will, I trust, find most of his lens questions answered herein.

The New England Convention

The event of chief photographic importance since THE PHOTO-MINIATURE last appeared was the seventeenth annual convention of the Photographers' Association of New England, held at Boston, August 10, 11 and 12, under the presidency of Mr. J. P. Haley.

The New England Association embraces the photographers of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and the Maritime Provinces. It has been fortunate in being officered by men as attractive in their personalities as they have been notable in the profession. And the members of the New England Association have the happy habit of coming back to their conventions with unfailing regularity, so that one meets the same faces year by year and the same delightful people.

The 1915 convention was remarkable for its infusion of new blood in the field of lecturers. There was an interesting illustrated talk on "Newspaper Photography," by A. J. Philpott, Art Editor of the *Boston Globe*. President Haley himself gave an illuminating demonstration of the making of artistic portraits—showing what to leave out. Prof. E. J. Wall, of Syracuse University, presented a lantern lecture on "Scientific Advances Made Possible by Photography." Mr. Dawes, of the Wollensak Optical Co., gave a talk on "Lenses." Dr. T. W. Smillie, of the Smithsonian Institution, sent his illustrated lecture on "The Progress of Photography from its Inception," illustrated with exhibits from the national collection at Washington, the lecture being delivered by Mr. W. H. Towles, president of the National Photographers' Association. Past-president John H. Garo held a big audience spell-

bound by his practical demonstration of "Posing in Portraiture." Mr. John I. Hoffman, the Secretary of the National Association, talked upon "Co-operation in Business;" and the writer of these notes had the privilege of half an hour's chat one afternoon on the "Possibilities of Photography in the Illustration of Newspapers, Magazines and Books."

Apart from these talks and the business sessions there was a very interesting exhibition of the work of the members of the Association, and a fairly representative showing of photographic specialties by many of the leading manufacturers and dealers. Taken altogether, the New England convention of 1915 was a model of what a convention should be. There was a free interchange of information, a practical discussion of everyday business topics and difficulties, and just the right amount of sociability to keep the crowd happy. I am publishing Professor Wall's lecture as an admirable summary of the field it covers.

SCIENTIFIC ADVANCES MADE POSSIBLE BY PHOTOGRAPHY

By PROF. E. J. WALL

Probably very few of you have realized how young photography is. As a matter of fact it is just seventy-six years ago, on August 14, 1839, that the first working description of Daguerre's process was published. Photography, as we know it today, is really only twenty-five years old. It is only within the last few years that it has been recognized as a science, hitherto it has been merely empirical or rule of thumb. A science it assuredly is, although most of you probably use it as a means for picture-making. The trouble is and has been that it is so easy to make a photograph that this has actually stood in the way of advancement of photography as a science.

The advances of late years are probably as well known to you as to me. The improvements in our sensitive surfaces, in our lenses, I need not dilate upon. That we have reached finality is, of course, an absurdity. As proof, I need only point to the discovery by the Jena Glass Works of the method of incorporating a large amount of fluorine in glass, which will have probably considerable influence on the future of lens-making. This is directly due to the application of scientific research, and it is only by the application of modern scientific research that further advances can be made. One of the most striking and hopeful signs is the enormous change in the theories of our various processes. To some, of course, theory is all rubbish, but it is out of theory that future advances will come.

Photography, in the widest sense of the word, is now of such universal application that very few people have any idea of its real usefulness. I propose to briefly sketch some of its uses.

In the domains of physics and chemistry important problems are being solved by the study of photographs of falling bodies, of the oscillations of the electric current. In this last case, whereas it would take a man some hours to trace the curves, we are now obtaining permanent records in a fraction of a second. It is probably in spectroscopic research that our science is of the most use. Photography has revolutionized the methods in this department of science. Whereas the visual method of wave-length measurement was a most laborious and time-consuming task, and the results were always open to question, we now take a negative and this is measured by any assistant. In all large steel works photographs of all alloy steels, etc., are made daily. Photography has here become as important as chemical analysis.

In the fields of astronomy and astrophysics our science has entirely replaced visual observation, and for two definite reasons:—the plate does not think and it never gets tired.

Because it does not think, it does not imagine that it sees things that are not, which is too often the fault of human observers. The latter also tire, whereas the

longer a plate looks, the more it sees, and, given accurate driving mechanism to the telescope, the exposures may be spread over several successive nights. You all know that the observatories all over the world are preparing an international star chart or photographic map which will serve for a permanent record for those who come after us. Photographs of nebulæ have revealed secrets that astronomers did not dream of.

Turning to more mundane affairs, the meteorologist uses photography for obtaining automatically thermometric and barometric changes; for recording the formation of clouds; of wave-forms; the tracks of windstorms and earth-tremors. The botanist has no longer to rely on drawings. It is no longer even necessary to dissect a plant to show its parts. By means of X-rays and the plate we can show the internal structure of the living plant. It has been proved by means of the plate that plants have eyes or lenses which condense the light on to the underlying tissue, and thus set in motion those photochemical processes which result in the formation of starch from its gaseous elements.

There is no kind of animal life that is not better portrayed by the camera than by the artist. Birds, beasts, fishes and insects are all made to sit and look pleasant. Distance is no longer an obstacle, thanks to the telephoto lens, nor is night a deterrent, thanks to flashlights fired by the animals themselves. The hunter armed with a camera is becoming as familiar as he with the repeating rifle.

Probably the most valuable application of our science lies in the amelioration of human suffering, the spreading of knowledge of the innermost structure of the human body and its appearance in disease. You have all heard of how a person was photographed in the ordinary way and blotches were seen on his forehead in the negative, although none could be seen visually, and how two or three days later he developed a loathsome disease. This story has been denied more than once, but it is an actual fact. As practical photographers, you know how the plate will accentuate freckles and other skin blemishes due to the peculiar color sensitiveness, or I should say, its color blindness.

In surgery the motion picture has become a most valuable means of education. It is no longer necessary for the surgeon, when operating, to be surrounded by students, nor for him to interrupt his work,—motion pictures of the operation can be taken and shown at any time.

It is not only the exterior of the body that can be photographed now. It is as easy to take the back of the eye as to take a snapshot in the street. I wonder how many of you will believe that lowering a camera into a person's stomach and taking a dozen pictures is almost as easy, if not easier, than taking a dozen portraits of the same person in the studio. Certainly in the former case the person cannot say that the portraits of his or her stomach are not true. In the second case he or she can say that the prints are not satisfactory, then the poor photographer suffers.

The application of photomicrography to the study of bacteria, both harmful and beneficial, that populate our systems is too well known to require more than mention; but probably the latest advance is in the obtaining of moving pictures of the war waged against the evil-working living bacteria by the beneficent leucocytes. The eating of a malevolent bacillus by a leucocyte has actually been photographed. It is impossible for me to remind you of all that our science has done in the field of medicine, but I ought not to omit the use of the X-rays. It is now generally admitted that these are merely vibrations or disturbances of extremely short wave-length, practically light which in consequence of our extremely limited powers we can neither see nor feel. You are all more or less familiar with the results. Since their discovery twenty years ago enormous advances have been made. In 1895 I had to give an exposure of ten minutes to obtain a radiograph of my hand. Today we can obtain a good radiograph of the heart in 1-3,000 second.

The applications of photography to land-surveys, either from earth-level or above it, are now reduced to practical methods. Nearly the whole of Canada has been photogrametrically surveyed. The Germans in particular have made extensive use of photography from

balloons and Zeppelins to record the surface of the earth. Two months ago there appeared in one of their technical journals some excellent photographs of the Russian lines in Galicia, and it was possible to clearly distinguish not only the advanced trenches, but also the second line of defence and even the holes made by the shells. Such photographs are of course of immense benefit to an attacking force. Every German officer is provided with minute photographs of the country he is expected to enter, and on these is clearly shown every hedge, house and road. The whole outfit, including an electric torch and an eye-piece, can be carried in the pocket. Every country is today using our science to study the flight of projectiles and their effect not only on the target but on the rifling of the gun-barrels.

Of the uses of photography in presswork and illustration I need not speak. You know as well as I do that photography has killed woodblock-making and steel engraving. Whether art is better for this is an open question, but it has been a potent factor in the dissemination of knowledge.

In ethnology and anthropology photography has entirely replaced the craftsman. The camera makes no mistake in drawing; it has no prejudices and for these reasons it is most invaluable to the explorer.

But it is in the cause of justice that photography has scored some of its greatest triumphs, nor is its use of recent date, for a burglar was caught in 1854 by means of a dauguerreotype. Judicial photography can easily be divided into two parts: firstly, the recording in permanent form of that which can be seen, such as the appearance of a place of a murder, and secondly, that which we may call its detective power, or the bringing to view of detail which cannot be seen by the human eye. Probably the French have brought the first branch to the greatest perfection but the Swiss, under Professor Reiss, have evolved the detective powers of the camera to a perfection attained by no other country. Some of his work transcends the wildest dreams of Sherlock Holmes. Charred paper has been photographed under special lighting, special plates and filters, and writing on it deciphered. Lithographic

stones that had been carefully polished till they showed no trace of an image to the eye at once revealed marked signs of forgeries to the camera. Falsifications of documents are mere child's play to detect, and you all know the famous finger-print system of Bertillon now adopted by all civilized countries.

For the reproduction of documents, paintings and old manuscripts photography is of immense value, and many of the old palimpsests have been deciphered by its aid when they completely baffled the most expert paleontologist. Beyond these, we have the familiar achievements of photography in the transmission of pictures by wire, and the obtaining of pictures from life in colors, of which the examples I will show you are themselves the most convincing documents.

Notes and Comment

On Wednesday, July 21, Mr. John J. Bausch, president and founder of the Bausch & Lomb Optical Co., Rochester, N. Y., celebrated his eighty-fifth birthday. As a memorial of the happy day, the employees of the company presented Mr. Bausch with an album containing a salutation signed by every one of the 2,500 employees.

Mr. Bausch's response to this attribute of affection became known on the following Saturday when the employees received their pay envelopes. In each envelope was a card inscribed as follows: "On July 25, 1915, I will have reached the 85th anniversary of my birth, and being able to enjoy my work in daily association with my employees, I desire to give expresssion to my feelings of gratitude by contributing $10,000 to the Pension Fund, $10,000 to the Relief Fund, and by making Monday, July 26, a holiday with full pay.

Mr. Bausch finds much pleasure in referring back to the trials of the early years of the great business of which he is the head and moving spirit. Especially

does he love to speak of the devotion of his wife, the mother of the sons who are now active with their father in the work of the Bausch & Lomb Optical Co. May he have many more happy years with them all.

My readers will be interested to hear that the Ansco products were selected for the highest honors at the Panama-Pacific Exposition, despite the fact that the Ansco line was not entered in competition; in fact the line was not on exhibition when the judges met.

One of the judges who had attended the Photographic Expositions recently held in New York City, noticing that the Ansco line was incomplete, turned to the jury and remarked "Gentlemen, the Ansco Co., is making the finest small camera I have ever seen. In my opinion, it is the best camera of that particular style in the world. but since they have not seen fit to place it on exhibition, we cannot take it into consideration." For the exhibit of such Ansco goods as were accessible, however, the Ansco Co. was awarded the gold medal and also the medal of honor, the highest award for professional photographic goods. This award covered the New York studio outfit with Ansco studio upright stand, Ansco printing machines and professional Cyko paper. The gold medal was awarded to the Ansco amateur cameras, Ansco film, amateur grades of Cyko papers, Ansco and Cyko chemicals. The line of small cameras referred to by the juror in the preceding paragraph is that represented by the Ansco Vest-Pocket Series, which have many special features distinguishing them from all other vest-pocket instruments.

"The Secret of Exposure," 72 pages, illustrated. Paper, 25 cents; cloth, 50 cents.

"Beginners' Troubles," 72 pages. Paper, 25 cents; cloth, 50 cents.

These two handbooks are the first issues in a new series under the general title "Practical Photography," edited by Frank R. Fraprie, S.M., F.R.P.S., and pub-

lished by the American Photographic Publishing Co., Boston, Mass. I am informed that they are intended to replace the series of 10-cent handbooks formerly published by this firm, being, in fact, new editions of these useful little books, with considerable revision and addition. The first two numbers received are crowded with practical information on their respective subjects and are well worth the price asked for them.

The New York offices of Burke & James, Inc., Chicago, have been removed from the ninth to the tenth floor of the Brunswick Building at 225 Fifth Avenue. This removal gives Messrs. Burke & James four times their former space and enables them to carry a much larger and more varied stock of supplies for their eastern trade.

The new "Rexo Manual," just received from Burke & James, is a 48-page booklet, fully describing the different varieties of Rexo developing paper for contact printing and enlarging, amateur and professional grades, with many tested formulas for the manipulation of the paper, including formulas for obtaining sepia, green, blue and red tones. Copies of the "Rexo Manual" can be had for the asking from either the Chicago or New York branches of Burke & James, Inc.

PLATE I

2 1

4 3

Fig. 1. By J. F. SIPPRELL
Fig. 2. By W. E. GLEDHILL
Fig. 3. By H. HAVELOCK PIERCE
Fig. 4. By MME. D'ORA

PLATE II

6  8

5 7

FIG. 5. By H. HAVELOCK PIERCE
FIG. 6. By W. E. BURNELL
FIG. 7. By H. HAVELOCK PIERCE
FIG. 8. By W. E. BURNELL

PLATE III

11 10

9 12

FIGS. 9, 10, 11, 12. By W. E. BURNELL

PLATE IV

13 16

14 15

Fig. 13. By J. F. SIPPRELL
Figs. 14 and 15. By W. E. BURNELL
Fig. 16. By W. E. GLEDHILL

PLATE V

19 18

20 17

Fig. 17. By J. F. SIPPRELL
Fig. 18. By T. L. JAMES
Figs. 19 and 20. By W. E. BURNELL

PLATE VI

23 24

21 22

FIG. 21. By VANDER WEYDE
FIG. 22. By FRANZ GRAINER
FIG. 23. By JOSEPH MAERZ
FIG. 24. By CLARENCE H. WHITE

PLATE VII

28 27

26 25

FIGS. 25 and 26. By H. HAVELOCK PIERCE
FIG. 27. By W. E. GLEDHILL
FIG. 28. By W. E. BURNELL

PLATE VIII

32 31

30 29

Fig. 29. By J. D. TOLOFF
Fig. 30. By H. HAVELOCK PIERCE
Figs. 31 and 32. By RUDOLPH and MINYA DÜHRKOOP

PLATE IX

35 36

34 33

FIGS. 33 and 34. By J. E. GIFFIN
FIG. 35. By ENDEAN
FIG. 36. By MARGARET S. SUTTON

PLATE X

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37

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Fig. 37. By H. HAVELOCK PIERCE
Fig. 38. By A. T. PROCTOR
Figs. 39 and 40. By H. HAVELOCK PIERCE

PLATE XI

44 43

41 42

Figs. 41 and 42. By W. E. BURNELL
Figs. 43 and 44. By J. F. SIPPRELL

PLATE XII

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47

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Figs. 45 and 46. By J. F. SIPPRELL
Fig. 47. Copyright by J. D. TOLOFF
Fig. 48. By H. HAVELOCK PIERCE

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Some Problems in Home Portraiture

Home portraiture has come to stay. More and more the public is showing a decided preference for portraits made at home, rather than amid the conventional trappings of the professional studio. The field promises a rich harvest to those who will give it the necessary attention. Many professional photographers have discovered this fact. Some have abandoned their studios altogether; others make the studio merely headquarters, and do a great deal of their work in the homes of their patrons. Not a few amateurs of the better sort have taken up home portraiture as a specialty with profit to themselves. Nearly every fair-sized town has an enthusiastic specialist in this field. In short, the wide-awake and progressive photographer of today sees the practical wisdom of getting close to the home life of his patrons. So, to many workers in photography, home portraiture is the simplest and surest way to success in life.

The first home portraits were, of course, made by amateurs, simply to secure pictures of the various members of the family. As the first attempts of beginners in this field, they were, generally speaking, somewhat crude. But the advanced amateur, long ago, with unfailing persistence, made himself master of the problems peculiar to photography in the home, and much of the best work produced in this field has been and still

is the work of amateurs rather than professionals. I need but recall the work of F. Holland Day, Rudolph Eickemeyer, Clarence H. White, Mathilde Weil, Eva Watson Schütze, and others too numerous to mention. The results obtained by these workers opened the eyes of the professional to the money-making, as well as the pictorial possibilities in home portraiture, and within a few years experienced portraitists such as Histed, Pierce, Koshiba, Anderson, the Cadbys, and Henderson had joined the since then ever-increasing ranks. It is logical that the home portrait should be preferred before the professional studio portrait by most persons of taste. The furnishings of the professional studio are rarely conducive to the best pictorial treatment of the subject. The average studio, with its elaborate fittings so unlike the home environment, deprives the picture of much that is interesting, natural, and artistic. The lighting arrangements in the average studio, while indispensable to the practice of professional portraiture, are very largely at variance with the conditions and light in which most of us actually live and move. Certain it is that ordinary living-rooms offer a wonderful opportunity for natural lighting, and at the same time give a guarantee against "faked" or artificial lightings, i.e., lightings where the light source is so confused that it cannot be reasonably explained, a temptation which most studio workers fail to resist. It is true that, so far as the technical excellence or merit of the print is concerned, there is not so much difference between a really good studio portrait and a portrait made at home. One will often be as true and characteristic a likeness of the subject as the other. But the home portrait will generally possess one quality lacking in the studio portrait: an additional spark of life, a certain feeling of intimacy called forth by the pervading atmosphere, which doubtless accounts in some measure for the preference given to the home portrait.

The Charm of the Home Portrait

This, then, is the big advantage of home portraiture. To be able to represent people in a more natural manner, when they feel completely at ease in familiar surroundings, in simple and apparently "un-

studied" poses, and to add to the interpretation the picturesque element of the home effect, which cannot be reproduced in a studio.

Naturalness: Intimacy

This sounds exceedingly simple, and yet this underlying principle of naturalness and intimacy, which is really the reason for the charm of home portraiture, is not so strictly adhered to as one would think it might be. Turning to our illustrations, the examples in PLATE I will show this plainly. A figure against a plain background, even if a picture-frame is pinned up on it, as in Fig. 1, can hardly be classed as a typical home portrait, although it may well have been made in the home. There is no particular home atmosphere about it and it might just as well have been made in a professional studio. Fig. 2 shows something like a home effect, but it was done in a studio, as the bars of the skylight in the adjoining room indicate. Also, in Mme. d'Ora's charming composition (Fig. 4), the piece of furniture constitutes the only element suggestive of home environment. Obviously the dressing-room of a professional studio might offer the same opportunity. The picture lacks the intimate touch characteristic of the home. On the other hand, Pierce's excellent print, "The Misses Wiborg" (Fig. 3), represents genuine home portraiture. It reveals in its attitudes and effects the atmosphere of an individual home.

The Worker's Viewpoint Controls

Of course, there are many who regard the practice of home portraiture merely as a substitute for regular studio work, or as a passing fad. They pay special attention to the lighting of the subject, and as a rule do not bother particularly about the background or accessories. They are fascinated by the unusual light effects, and leave the rest to chance. If the background turns out well, so much the better; but, if it proves unsatisfactory, a worked-in background is utilized to cover the deficiencies of the negative. I have no quarrel with this latter method, provided the work on the negative or print be done with fine discrimination. It is often an advantageous method where the only available background detracts from the interest of the subject.

But here we cannot concern ourselves with such accidental successes, confining our discussion to practical suggestions whereby pleasing results may be more methodically obtained.

The Viewpoint Here

In this monograph I propose to deal with some problems in home portraiture from the viewpoint of the professional or advanced amateur. The elements of home portraiture, for the beginning amateur, have already been dealt with in earlier numbers of this Series, as in The Photo-Miniature Nos. 65, 118, 127. Nevertheless, in what follows, even the beginner in home portraiture will find many profitable suggestions, since the aim of the whole work is to help the reader to produce the most pleasing results possible by the simplest means.

Figures Rather Than "Heads"

The special trend of the work makes us readily arrive at the conclusion that the home portraitist should, whenever possible, favor the three-quarter or full-length view of his subject, with a more or less liberal background. Except in the case of large heads and very few other instances, the complete elimination of surroundings is a mistake. When, however, the bust, head, and shoulder portrait is desired, then, perhaps, the photographer should seek to reproduce, so far as is possible in an ordinary room, the so-called studio or portrait lightings. This because the proper rendering of facial detail, as in a portrait where the head occupies a large part of the picture, demands a much more precise and intricate handling of the light than the taking of figures or groups.

The Home Portrait Outfit

The first consideration is the outfit or equipment. This can be summed up in a word or two. It should not be too bulky, and yet should contain all that is essential to get successful portraits from the start. Some amateurs have made technically good and pictorially pleasing home portraits with the simplest form of hand-camera used upon a stand or other convenient support. F. M. Steadman, during an extended trip through the towns and villages of Central America, made a small fortune in home portraiture, using a 3A Kodak, a tripod, and a

Kodak film tank, as his sole equipment. But the serious worker in this field equips himself more substantially, with an eye to possible difficulties as a rule.

Miss Loehr's Equipment

Miss Pearl Grace Loehr tells of her home-portrait outfit as follows: "The camera should be one capable of using 5 x 7 plates. It can be an inexpensive folding-box camera. or, what has proved most satisfactory to me, a 6½ x 8½ view camera. This camera can be fitted with a special back for the use of 5 x 7 plates, thus allowing pictures of either size to be made, as may be desirable. I have found a camera of this size preferable to the smaller one, because it carries with it a businesslike air which seems to impress people with the fact that you are really a professional.

"In selecting a lens, bear in mind that there are several things the lens must do. It must be quick and it should be fairly wide angled. A reliable tripod will save lots of unnecessary trouble and exasperation. With this some good materials should be carried for plain backgrounds. Art linens, some of the fabrics used for interior decoration, and even dress-goods, in soft greens, browns and grays, prove most satisfactory as to tone. By sewing small leaden weights on the lower edges, you will always have a well-stretched background at your service. These plain grounds, of course, are used only when this is really necessary.

"For the portraiture of children at home, I find the flashlight indispensable. The flashlamp should have an umbrella or other arrangement for diffusing the light, and it should be connected with the camera in such a way that one pressure of the bulb releases the shutter and ignites the flash. Because of the many difficulties in home lighting, the use of orthonon plates will generally yield the best results."

Claudy Prefers a Graflex

For the indoor portraiture of children and old people, where precision of movement and quick action are often needed, C. H. Claudy prefers the Graflex camera, held in the hand, of course. This means a very rapid lens and exposures sometimes as long as $\frac{1}{10}$-second; which again means a quick-working light, great steadiness in the

handling, and sureness of operation. The practical advantage of the reflecting mirror type of camera is that, having the image before one right side up to the moment of exposure, in its full size, right side up, one can give all one's attention to the composition of the portrait and seize the most favorable moment for the making of the picture—of great value in photographing children. The home portrait Graflex and Ensign Folding Reflex are thoroughly reliable cameras of this class, and their use in this field is now fairly general.

Anderson's Experience

Paul L. Anderson says: "My experience has been that, if anything more than a casual snapshot is desired, the folding hand camera is the most difficult of all to handle, and should be adopted only by those who have had considerable experience in the use of a focusing screen. If such an instrument is to be used, it should be fitted with the largest possible direct view-finder, and the focusing scale should be extended so as to permit of focusing an object at a distance of 4 feet, which adjustment is much more desirable than the use of the much advertised portrait attachment."

Mr. Anderson also refers to the usefulness of the home portrait Graflex, or any similar camera of this class, in amateur portraiture, but his preference is given to a camera of the well-known view type, having a long bellows with slight taper, which permits the use of long-focus lenses of comparatively large aperture. In his own practice he uses an 8 x 10 camera, which, with tripod and a dozen plates, weighs not far from forty pounds. In lenses he deprecates the use of an anastigmat, as giving an unpleasingly sharp wiry definition to the picture image. But he concedes its big advantages in speed and a flat field, two qualities which play an important part in producing just the sort of portraits preferred by the majority of those for whom the amateur will most often attempt portraiture. In many cases, he adds, the speed of the anastigmat is essential to success. For much of his work he uses a rapid rectilinear or single achromatic lens working at $f/8$, or one of the several soft-focus lenses, such as the Verito, now so popular.

Burnell's Outfit

W. E. Burnell, who contributes several portraits to the illustration of this monograph, uses an 8 x 10 view camera, a Heliar lens of 12 inches focus, working at *f*/4.5, and Cramer Crown plates. He has a flashlamp of his own devising, which uses only 10 to 12 grains of powder for a flash. He believes in ample exposures, and uses the flash in conjunction with daylight only when necessary, chiefly for the correction of too-deep shadows or subjects including large dark masses, as in the making of family groups indoors.

Crum's Equipment

F. E. Crum, a successful home portraitist in a small town, describes his equipment as follows: "For home portraiture I generally use my regular 6½ x 8½ view camera, although I have sometimes found my 4 x 5 hand camera, fitted with a rapid lens, very convenient, especially as one can now make enlargements from small negatives which are hardly distinguishable from large contact prints. The fastest lenses are necessary in this work, and one of medium focal length will be found the most generally useful. I use a lens of 10½ inches focus whenever the available room space permits. A tripod stay will be found practically indispensable. For my general practice, I use a lens working at *f*/6.8 and fast plates, giving exposures of from $_5$ to a full second. Sometimes my plates are a little underexposed, but that is better than movement in the subject."

Miss Weil's Outfit

Miss Mathilde Weil goes about her home portraiture with an equipment which comfortably fills an ordinary leather suitcase. She employs a 6½ x 8½ view camera and an anastigmat of 12 inches focus working at *f*/6, which generally permits of exposures of one second in the ordinary house. The camera is, of course, used upon a substantial tripod, and the lens is fitted with a silent shutter, the suitcase holding these with a focusing cloth and eight double plateholders. Miss Weil uses plates, but her plateholders are fitted with aluminum film-sheaths, permitting the use of cut films such as the Eastman portrait films. These are much lighter than plates, and, of course, unbreakable.

Breckon's Methods

Mr. W. O. Breckon, a professional working in home portraiture as his special field, employs an 8 by 10 field camera, with a substantial tripod, a large black cloth (about 7 ft. by 9 ft., the purpose of which will be explained later), eighteen double holders and a protecting dark curtain projecting from the camera front about 2 ft. and fitted on a wire frame adjusted to the side of the camera. The lens which Mr. Breckon finds most suitable for this kind of work is a 3D Dallmeyer, of 12 in. focus.

His method of working is not confined to any hard and fast rules; the varying circumstances under which he has to work, especially regarding conditions of light, make it impossible to adhere to any fixed rules; but, speaking generally, his policy is to get the subject as near the source of light as possible and lighted at an angle of 45 degrees.

Many of Mr. Breckon's most pleasing portraits have been obtained by posing his subject directly in front of a well-lighted window, and he contends that there is not the slightest difficulty in getting excellent results in this way, provided a flood of light comes from the direction of the camera. Speed is one of the great essentials of home portraiture; one has to think and act quickly, the continual alteration of light making quick action imperative.

Where the environment of the room does not lend itself to an attractive background, the large black cloth (mentioned above) is substituted, and in the after-treatment of the negative a hand-worked background is inserted. For obvious reasons a large percentage of home portrait negatives require a good deal of careful after-treatment. Intruding patches of light, and shadows which are too deep, call for local reduction or intensification, and frequently the entire background has to be wiped out. Mr. Breckon uses a preparation of sulphuric acid and permanganate of potash where reduction of such a radical character is required. With a pad of cotton-wool saturated with this solution, and using extreme care, the background can be entirely removed and a more suitable one worked in.

No doubt, the reader will have his own ideas as to what will constitute for him the simplest and most practical equipment. There are now obtainable in the open market several home portrait outfits which cover all the requirements. Experience will teach the worker what to eliminate, add or substitute, and in a year's work he will evolve for himself that particular equipment which is best suited to his own individual methods.

Tripod and Stay

The tripod is an important part of the home portraitist's equipment, and seems to give a good deal of trouble. There are several makes which are at once rigid, adjustable, and portable, the three legs opening up simultaneously, and not closing until you want them to. When set up, these special tripods may be moved around, will slide smoothly over any kind of floor, and cannot be accidentally upset. The ordinary variety of tripod can, of course, be steadied and made rigid by means of a tripod stay. If this convenience is not available, then a long piece of string turned about each leg three or four times, about six inches from the ground, and finally tied together, will make a reliable temporary stay.

Reflectors and Screens

As for the use of reflectors and screens, these are no longer deemed a necessity by professional workers, although they may sometimes be found advantageous in home portraiture, where the lighting of the subject offers peculiar difficulties. When needed, a reflector can easily be extemporized: a sheet, a newspaper or a white towel being fastened to any convenient support, placed against a chair, or held up by a member of the family on the shadow side and a little to the front of the sitter. Some home portraitists are more particular, and carry reflectors of various sizes, shapes and colors, so that they can control the light and throw it just where it is needed to give the effect desired in the portrait. A few yards of thin white and black and light yellow muslin, with a wire shape or two, will provide sufficient material for most forms of light screens. In the hands of the skilful operator, the use of these screens between the subject and the light is akin to brush development, so far as local control is concerned. A few sheets of blue-

white tissue paper, easily carried, will often afford a sufficient light screen for the average subject.

The Lens

With regard to the lens, the difficulty of selection has been indicated in preceding paragraphs. It seems to be largely a matter of personal choice with the worker, depending upon what he finds he can do with the type most favored. Professionals working in home portraiture generally carry several lenses, varying in focal length (as often deciding the scale of the image) and in defining quality, some patrons preferring fairly sharp definition, and others favoring the soft diffused effect given by the single lens or one of the modern soft-focus objectives. Charles W. Hearn tersely puts it this way: "Get a lens that works quickly, cuts well, and does not require too great a distance, working reasonably near the subject without distortion. Rapidity is the biggest advantage in case of emergency."

Flashlight

The use of the flashlight in home portraiture needs careful consideration. The pictorial worker rarely, if ever, employs this form of light in home portraiture; but in professional work, which one might say is everyday work, the use of the flashlight is becoming more and more general. It is employed to supplement daylight where this is necessary or desirable, to throw local light into the shadows of the subject where these are obtrusively heavy and difficult to handle, and more especially in the photographing of children, elderly sitters, and small groups in the home.

Useful if Well Handled

The successful use of the flashlight in home portraiture, if the results are to be indistinguishable from those obtained with daylight, is a science in itself and calls for considerable study, despite all that the flashlight manufacturers say of its simplicity. Once the method of its use has been mastered, however, there can be no question of its great convenience and efficiency. For example, it permits the making of portraits at any time and in any place. It also permits of a very wide range or lighting effects. Nor must we overlook its great usefulness in home affairs such as weddings, anniver-

saries, parties and the like, which all fall under the heading of home portraiture, and should not be left to the commercial flashlight worker.

It is beyond the scope of this monograph to enter upon the details of flashlight manipulation. The subject is very fully dealt with in THE PHOTO-MINIATURE No. 135, to which the reader is referred. The introduction of flashbags, in place of the open flashlamp, with portable electric connections, enabling one to fire separate charges simultaneously with the opening of the exposure shutter, has done away with many inconveniences and especially with the bugbear of smoke.

Raymer Explains Its Use

The fundamental principles of working with the flashlight in the home are clearly explained by Felix Raymer, in dealing with small portrait groups. He advocates the use of two flashbags, one containing a larger charge than the other, the two bags being used in the same manner as the skylight and a reflector, or as primary and secondary lights. The primary light is that which gives the illumination, character, and projection to the face, by causing more or less distinct shadows to the features. The secondary lights are those which blend these shadows into soft and transparent shades, giving gradation and modeling. By using the two flashbags just as you would work with the primary and secondary light in the studio, you can obtain pretty much the same results in the home.

Mr. Raymer continues the description of his method as follows: "The object in having a separate flashbag, with the smaller charge of flash powder on the shadow side of the subject, is to illuminate the shadows. This second lamp must be handled carefully or it will destroy the modeling. The charge of powder used in it should be about one-quarter the quantity used for the charge in the flashbag employed to give the primary or principal lighting of the subject. This latter flashbag, with the heaviest charge, should be considered as a skylight or window, and placed so that the light will fall from it on the subject just as it would if a skylight were being used. To know when the lamp is right for this purpose, usually at an angle of about 45 degrees,

all one has to do is to raise the flashbag above the subject's head the same distance it is away from the subject. If it is 5 feet from the subject, then it should be raised 5 feet above the head of the subject. The distance the lamp is placed away from the subject, whether in front, to either side, or directly behind, is controlled altogether by the angle of the lens. When a wide-angle lens is used, of course, the lamp must be farther away from the subject, and also raised higher, to conform to this principle. It is equally obvious that the light from the flash must not strike the lens when the flash is made, any more than sunlight is permitted to strike the lens in a daylight exposure. The two flashbags should never be placed directly opposite to each other, with the subject between them, but should bear the same relation to each other as the skylight and reflector have in ordinary studio work."

Pro and Con

Pictorially, the flashlight portrait is often criticized. It is said that the lighting effect is harsh, that the eyes lack life and that the shadows lack depth. The reason for this is, generally that the lamp used is not large enough and does not permit of sufficient illumination to reach around the sitter. When properly handled, the flashlight will give a portrait which even the expert can hardly recognize as a flashlight rather than a daylight picture. But it is probably as a means of supplementary lighting, where the portrait is made by daylight in a somewhat dark corner, where the surrounding draperies are heavy in tone, where the exposure is made on a stairway, or where children are photographed in a nursery, that the flashlight is of the greatest value to the home portraitist. Figures 6 and 8 in PLATE II were made by direct flashlight. The prints on PLATE III, by W. E. Burnell, were all made with the flashlight combined with daylight, to obtain instantaneous exposure. Mr. Burnell uses the flash as a large or small reflector according to where the accents are desired in the picture. His figures are all clearly lighted, perhaps too much so. The flash seems to confuse the original lighting scheme, and to make the lighted planes too uniform, especially in Figs. 11 and 12, PLATE III.

It may be that he could not get the flash near enough to the subject to get a more rounded illumination. As a general rule, the farther away the flash is placed, the softer and flatter will be the result.

The Question of Illumination

The question of the illumination of the sitter and the exposure are vital questions in home portraiture. It is not easy to give precise or definite information here, since the conditions vary enormously in different homes and localities. The few suggestions which follow, however, may be helpful to the professional worker, who, having the image before him on the ground-glass of his camera, will not often find much difficulty in determining the exposure required under any given conditions or variable circumstances.

Daylight Generally Ample

Contrary to the first impression one gets on entering this special field, experience has shown that there is usually sufficient light or illumination in the average home to ensure an ample exposure for the great majority of subjects, under normal conditions. This is the big fact to keep in mind and to work upon. Adapt your working methods to this principle. Weather conditions or the time of year or day, and the position of the sun at the time of photographing may interfere; but the experienced home portraitist rarely finds himself blocked for lack of light, hence the use of daylight for this class of work is almost universal, the flashlight being necessary only for extraordinary conditions, subjects, or special effects.

Varying Conditions

A cloudy, rainy day will call for care in the selection of the place for the sitting, especially where the rooms of the home are shaded by a wide veranda or nearby trees or shrubbery in full leaf. The time of midday, with the sun shining unobscured, will rarely be conducive to the best sort of work. It may be taken, in general, that, the more intense the light, the deeper the shadows will be, which again will require stronger reflected light. Under such conditions, subjects dressed in dark clothing, or with accessories or surroundings heavy in tone, may present special difficulties, which should be seen to

before exposure. The most favorable lighting conditions are secured on a brightly lighted but cloudy day, when there is an abundance of bright but diffused light, or in the morning or afternoon hours. Even if the exposures are thereby prolonged, these conditions avoid too sharp a contrast of light and shade. A north light is always reliable because of its greater steadiness, although an east light in the afternoon, or a west light in the morning does very well. The principle is to seek diffusion in the general illumination, to prevent over-emphatic contrasts in the subject.

No two homes are alike in this matter of interior illumination, even in rows of houses where the outside architecture of one is a replica of all the others. Conditions will sometimes be encountered that baffle even the experienced worker. The only remedy is to train one's self to grasp the situation, be it what it may.

Studying the Home Light

For the beginner in home portraiture, and even for the professional beginning in this field, a few experiments in his own home, to determine the actinic quality of indoor illumination in different rooms, will be found most helpful. These experiments should be made with an exposure meter of the Wynne or Watkins type, which give what is known as a light factor (a figure representing the actinic power of the light) by the use of sensitive paper. There is no need to use a camera or plates for these experiments. By exposing such a meter to the light, say near a window, and noting with a watch the time required for the sensitive paper to match the "standard tint" in color or depth of tone, we get a figure which represents what is known as the "actinometer time" of the light at that hour and place. By comparing the actinometer time so obtained in one place, with the time required to get the standard tint in another part of the room or house, where there may be more or less light, we get a definite idea of the relative intensity of the light in both places. For example, if the first test near the window gave us the standard tint in 10 seconds, and a second observation made at a distance of 5 feet from that window gives us the standard tint in 60 seconds, we know that the actinic power

of the light there is six times weaker than at the window itself, and, consequently, that a subject requiring ½-second exposure at the window would need 3 seconds' exposure if placed 5 or 6 feet away from the window. By repeated experiments of this kind, under varying conditions, we can quickly gain a clear understanding of indoor illumination and exposures, which will obviate many failures when we set about the actual work itself. The use of an exposure meter, as suggested, is the simplest and least expensive way of obtaining this very necessary knowledge of indoor illumination, which is so vital a factor in home portraiture.

Avoid Under-exposure

Most home-portrait negatives are under-exposed. In the majority of cases, this results from the employment of a small stop in the lens in order to obtain the required depth of focus. The remedy is to use as rapid a lens as possible, and to master the art of focusing so thoroughly as to be able to get desirable depth throughout the picture image without the use of small stops. A great deal more is possible in this direction than most workers imagine. We do not pay sufficient attention to our focusing, and especially in the differentiation of definition in the different planes of our figure composition. A wise rule is that which tells us to focus sharply upon the eyes of the subject as usually the point of chief interest in a portrait.

It is probable, too, that much of the under-exposure prevalent in home portraiture is due to the inabilty of the average worker to properly appreciate the light and shade contrasts, and the failure of the photographic plate to reproduce the luminosity contrasts of the subject as seen by the eye.

A Helpful Rule

The most helpful rule for exposure and development in this class of work is to expose for the shadows and develop for the high lights. The conditions which produce undesirable contrast are a slow plate, small diaphragm, intense direct lighting, under-exposure, cold and strong developers, an indiscriminating use of restrainers, over-development and slow drying. The factors which make for the softness most desirable in the home por-

trait are: fast plates, a large diaphragm, diffused lighting tending toward flatness, ample or over-exposure, warm and weak developers, and under-development. More about this point of development later.

Look Over the Field

There are really few rooms in which a full normal, or at least a satisfactory exposure cannot be made. One of the first things the home portraitist should do on arriving at the scene of his work is to make a survey of the house, sizing up the conditions of illumination, and discovering or locating the most suitable places for the posing or arrangement of his subjects. The special wishes or inclinations of the patron must, of course, have due consideration. But, in order to ensure the best possible results, the photographer should consider himself, for the time being, as master of the domain, and cover the available possibilities as to location for sittings, if possible, in the company of his sitter. This will give him the range of the possibilities of the home, and also serve to give him some acquaintance with the personalities of his subjects.

Choice of Location

It may be that the hall, parlor and sitting-rooms on the ground floor are surrounded by a wide porch or veranda which darkens them beyond all hope for daylight exposures. In such a case, it is well to make a survey of the rooms on the second story, which are generally better lighted, less curtained, and less crowded with furnishings and what not.

The conditions are generally more favorable in large than in small rooms. In a large room, one can generally secure an agreeable perspective by getting away from the subject. This will permit of the use of a lens of fairly long focus, which in turn means a larger image on the plate, and a more agreeable drawing or rendering of the subject. In small rooms, one is often put at one's wit's end to get a viewpoint of the subject which will be free from exaggeration or distortion. There is no space available for the camera; that is, one cannot get far enough back to remove the camera from objects right under the lens. A good general rule is that the farther the camera is away from the sitter, the better

will be the perspective and proportions secured. Oftentimes it will be possible to view the sitter from outside the room, through a door from the adjoining room or balcony. Every expedient of this sort which will give the advantage of an extra foot or two will make a decided difference in the portrait.

The Point of View of the Subject

If the tripod proves too unwieldy or awkward in the only space available, a small table or any other convenient support may be substituted. Sometimes one can work the camera from a bookcase, mantelpiece or chair, and so get a more pleasing view of the subject from a point where the tripod could not be set up without inconvenience to the subject.

A lens of moderately short focus will be necessary when working in small rooms. Such a lens necessarily involves incorrect drawing or perspective, and should be used with great care and only when it is absolutely unavoidable. Some home portraitists go so far as to say that the lens should have a focus of 18 inches for an 8 x 10 plate. Anderson would even extend this focal length to 27 inches, where possible, but this seems somewhat extreme. As we have seen, a lens of 12 inches focus is generally used in the making of a 6½ x 8½ portrait. It should not be forgotten that there are in the market compact high-speed lenses of long focus requiring only a short bellows extension to the camera; for example, a lens of 20 inches focus on a camera having an extension of 10 inches. Such lenses give an image approximately twice as large as that given with the ordinary lens and the same camera extension.

The Height of the Camera

A common error in working in small rooms is an uphill look about the floor, as in Diagram 1, also noticeable in Fig. 11, PLATE III. This is due to the application of too oblique a floor line and the use of the lens too high above the floor level. The effect of seeing the floor running uphill may be mathematically correct, but it is not pleasing to the eye. This calls our attention to the importance of the height of the camera, which is too often regulated to suit the convenience and bodily comfort of the man behind the camera, instead of

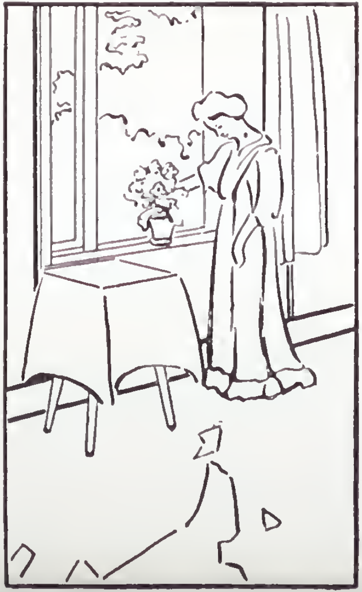

Diagram 1

Diagram 2

Diagram 6

being adjusted to the particular pose of the sitter with the accompanying background and accessories. We ought to bear in mind that a few inches difference in the height of the camera make as much difference in a composition as so many feet in a horizontal position. With standing figures, a height of about 5 feet may be taken as the average elevation of the line of vision, while in a seated figure, the height may be about 15 inches lower. In many instances, 3½ and 3 feet will be found more advantageous. As Pierce tells us, there is no hard-and-fast rule: "One may have to stand on a table (as he actually had to in Fig. 30, PLATE VIII), or lie sprawling on the floor. The position of the sitter dictates the height of the camera. Only the result counts." The finished picture should, of course, show the sitter at the level from which his or her friends would ordinarily see them in each case.

Development

Now a word about development. The common mistake, as has been said, is over-development. If we go by the rule to "expose for the shadows and develop for the high lights," this mistake may easily be avoided. In order to compensate for the real or fancied lack of illumination, and the tendency to over-emphatic contrasts, the best developer for home portraiture is one which brings the image up quickly in detail, and then builds up the density contrasts gradually. Always it is better to slightly over-expose and to slightly under-develop. The temperature of the development is important. Miss Weil, whose negatives generally yield fine, able-bodied platinum prints, advocates the use of a thoroughly "safe" light and plenty of it in the darkroom, together with a developing solution kept as warm as may be, short of melting the film and running it off the plate. This is a counsel of perfection which should be followed with careful discrimination. One needs to know one's plate, and to have regard for the general temperature of the day or season. It may be said that, when the developing solution feels about tepid to the finger, it is perfectly safe, and that the danger line is reached when it feels warm, not to say hot. Before adopting this plan, it is well to experiment a little. Let the reader

take two plates of a subject showing plenty of contrast, give them exactly the same exposure, and then develop one plate in the predetermined developer at the normal temperature of 65° F., and the other in a developing solution heated up to say 70 or 75 or even 80° F., according to what the film will bear. Since the whole subject of development is comprehensively covered in THE PHOTO-MINIATURE: No. 139, I need not give it further consideration here, except to point out that it has a very vital influence upon the quality of the negative in home portraiture, and cannot receive too much attention from those who follow this sort of work.

Studying the Subject

Previous to the arrangement of any special pose, or the beginning of the actual work of picture-making, it is most desirable to get a fairly clear idea of the personality of the sitter, and of the impression which your portrait of the particular subject in hand is intended to convey. Mental notes should be taken as to the complexion, color, and texture of costume, the deportment of the sitter, and so on, and from these a characteristic attitude or pose should be selected. If you can manage to keep your sitters moving about in freedom and unrestraint, they will act naturally enough, and assume convincing and favorable poses which reveal their individual charcteristics. Still, it is at this point where the creative imagination of the artist comes into play, which marks the difference between the craftsman and the ordinary worker. The photographer with taste and imagination always thinks of his subject in a certain effect or design, in terms of light and shade, beauty of line, space division, etc., and it is this which influences the composition, whether the finished print turns out to be pictorially satisfactory or not. What the home portraitist wants is a *picture*, a pictorial incident, which conveys something beyond the person depicted. As much attention has to be paid to the environment, accessories, and occupation as to a characteristic attitude of the figure, and yet the likeness quality is almost as important as in studio work. Although diffused images or soft focus effects are at times highly artistic and much in favor with some people, the

majority of the public still prefer clear definition and some facial detail. The information in this treatise is given largely from this viewpoint.

Selecting the Place for Exposure

We now come to the selection of the most favorable places for exposure. We will choose *typical* places, such as are most frequently met with in the average home, and then regard each location separately from the point of lighting, arrangement, and pictorial sentiment. They are as follows:

Ordinary poses in large and small rooms.
The subject seated near a table or at a desk.
Near the window and directly at the window.
In the library.
At the door.
Curtain effects.
At a mantelpiece.
At the piano.
In a dark or cozy corner.
With a wall as background.
On the stairs.
In odd places.
In the conservatory.
On the porch.
In the nursery.
Out-of-doors.

Typical Rooms

It is rarely, nowadays, that we find a room with such a high source of light as in Diagram 2. It is met with only in old residences. The high window gives a most desirable light, almost like a skylight. It is not quite wide enough, but adapts itself easily enough to bust portraits, ensuring the necessary roundness and gradations. Even then, as in all other cases, the sun's rays should not fall directly into the room, but only touch the windows. Falling more to one or the other side of the window, they produce a more diagonal and artistic lighting.

A room with windows at each end is excellent if one of them is partially covered up. The stationary curtains and shades will generally be sufficient. The screening of the lower portions of a window is a nuisance, and wastes considerable time. If, however, they extend to

the floor and no curtains are available, colored tissue-paper and oiled-silk or paper will soften any offensive brightness. Most reliable, also, is a long, rather narrow room, with a bay-window and no other source of light. It would be safe to place the sitter on almost any place of the dotted line in Diagram 3 and even farther back, and to use the center window B as source of light, to draw the curtains on side window A or C, as the case may require, and to use the other as reflector. It will produce a good bust portrait with good detail, and, if that can be done, of course also interesting figure compositions are obtainable.

Conditions Known and Unknown

But it is not always as easy sailing as this. In these instances the lighting resembled that of the studio. In the studio the light capacity is fully appreciated, its changes for every hour of the day are known, also that certain handling of screens and backgrounds will give certain effects. The operator knows all that can be done with the light and works automatically. Not so in home photography. The light may come from one window, and it may come from many windows, from one, two or three sides. The room may be light and airy in hangings, or it may be dark and somber. Meeting these various conditions, the operator should strive for the interesting things that are offered in individual lighting.

Although innumerable lighting effects can be produced in most rooms, it is well to train one's sense of orientation by giving thought to the general lay of rooms, and what light conditions would most frequently occur. No system, reliable in all instances, can be advanced. Only a general idea and a few rules, that will help to prepare the mind to judge the possibilities of lighting one's subjects as soon as one enters a room that one has never seen before.

Diagram 4

Let us imagine a parlor that, in regard to shape and the situation of windows and doors, has nothing unusual about it. It is fairly long, has two windows in front, and two on one side, of which one is situated near the end of the room and comparatively isolated. At one glance, the

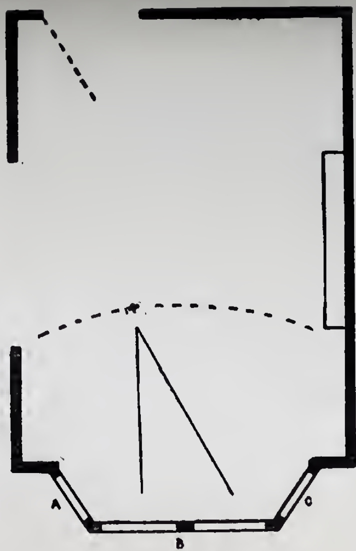

Diagram 3

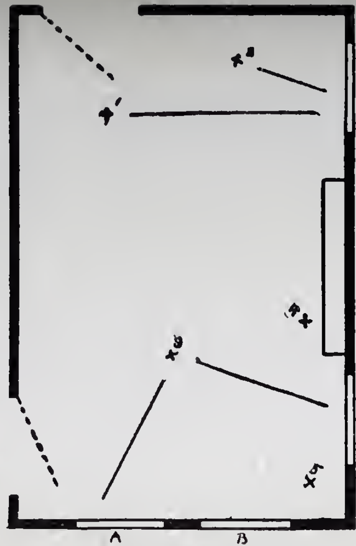

Diagram 4

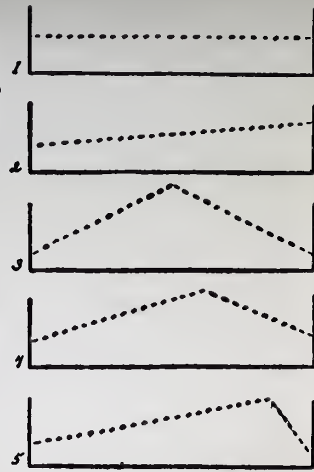

Diagram 5

experienced portraitist would realize that the places marked 1, 2, 3 in Diagram 4 offer good opportunities to pose a sitter. If the window D is used, the other three windows are of no particular importance. C should be shut off, but A and B could be either open or darkened, just as the strength of the light dictates. Position 2 would give a normal division of light and shade in a three-quarter view (viz. Fig. 48, PLATE XII), The light is apt to fall almost, but not quite, full upon the face. The exposure needs to be carefully judged, othewise there will be danger of general flatness. No reflector would be necessary if the windows A and B are open. If you put the sitter farther back to position 1, the figure will be better in the room, and the background will compose itself more readily. It can be done safely when the general effect of the figure is light. If the draperies are dark in tone and nonactinic, reflected light will become absolutely necessary. A dark, ruddy complexion also requires stronger reflected light. Modifications of frontal, Rembrandt, and the conventional three-quarter lighting are all possible. The sitter will receive a mellow and fairly powerful light, and, by placing the person a few inches this way or that, with a change of attitude to face the window more, or vice versa, very beautiful effects will be obtainable. Slight change of location is the best remedy for too strong contrasts.

A Variation

Position 3, Diagram 4, with B and D darkened, and A and C partly curtained off, will yield strong light planes, clear and light shadows, with decided accents of actual forms. It is a lighting that *draws* well. Position 5 would give the effect of double lighting, much in vogue of late, which concentrates all the shadows in the middle of the face and figure. But this lighting calls for discrimination. A too symmetrical distribution of the light should be avoided. Anything approaching a full-face view or a straight standing figure will not bring out the most picturesque effect. The figure should be angular in tendency, as in the clever composition of T. L. James, Fig. 18, PLATE V. This picture also proves that the pointing of the lens into the opposite angle or corner of a room is really no fault, if properly managed.

Lighting from Behind the Subject

Back-lighting, where the greater portion of the face is in shadow with, usually, a strong light on the side away from the camera, as in Fig. 16, PLATE IV, will often be found useful. In very small rooms this is frequently the only lighting possible, as a sufficient distance between camera and sitter can be secured only by placing one or the other in the doorway or outside the room altogether. The main principle in home lighting is to do the best one can with prevailing conditions, to do all one can with the light itself, using a reflector only when absolutely necessary. Sane, sensible lighting should always be striven for. If the light on the shadow side of the face makes a V shape, one is always pretty near a good portrait or painter's lighting effect.

Other Lighting Effects

So-called freak lightings, often caused by a dusty lens, or by strong light shining directly into the lens, or by light entering the camera other than that forming the image, should be avoided. Accidentally they may produce a startling and eccentric effect, but the uncertainty does not warrant to take any special risk. If a silhouette effect is desired, place the sitter very near to a strong source of light, and face the camera directly against it. If marginal lighting or a cameo effect is sought for, place the camera nearest to the source of light, pointing away from it toward the light side of the face at right angles. It is really the lighted side that is taken, but the whole face is in shadow, excepting the projections of the face. The nearness of the face to the light opening and direction depends upon whether a profile, three-quarter, or full view is wanted. Fig. 2, PLATE I, is a good example of shadow lighting.

Local Atmosphere

If you place the figure at some distance from the light source, near to some wall or corner, the chances for a true homelike effect increase. A desk or a table, as in Figs. 12 and 14, PLATES III and IV, will do wonders. Just seat the subject in a comfortable chair near a table or desk, and occupy him or her in reading, sewing, writing, or just in an attitude of leisure or medita-

tion. The simplest employments will be the most convincing. Choose the most suitable one. A young, slender girl may look well arranging flowers, but it would hardly suit an elderly lady or a very stout woman. And who could fill that particular corner in Fig. 7, Plate II, but a stately matron in an elaborate gown? Everybody else would look out of place there, just as she would look out of place in any location except a room for state occasions. The main thing in arranging an interior composition is to portray your subjects and accessories as if they had not been arranged, but were photographed just as they usually are in everyday life. Emphasize the "daily use" by an open magazine, a work-basket, a letter, a hat and gloves, a pipe laid on a book, and other similar objects,—in short, anything that will suggest a personal touch and general human interest. The more a room is used, the more homelike the effect will be. The sitting-room and nursery in this respect are preferable to all "special-occasion" rooms. You may have to remove furniture, take pictures down, shove bric-a-brac aside in wholesale fashion. Do not hesitate a moment if they interfere. Bear in mind that the lens tends to exaggerate and distort the objects nearest to it. A small round table, for instance, appearing in the corner of the foreground, will probably come out far too large. To move the table from its accustomed place to some other within the picture area may make a scene look crowded. Omit it altogether, as its absence will not be detected.

Foreground

One important rule is, keep the foreground clear; very much as in a stage scene. An empty foreground always helps an interior composition. It suggests distance, space, and atmosphere. The horizon, or floor line dividing floor and wall is worthy of serious consideration. There are only five variations possible (at least so far as the principal direction is concerned), as shown in Diagram 5. The floor line runs either in a straight line parallel or diagonal to the lower margin line, or it makes blunt angles with one line much longer than the other, as in Figs. 4 and 5, Plates I and II. They differ, of course, but always conform to the fundamental form.

Each of these floor spaces, excepting that in Fig. 3, which is difficult to handle, has its merits.

Comparisons

Compare them with the accompanying illustrations, and you will find that 1 has very much the effect of a straight background, no matter how much the accessories may obscure it. The others give a better idea of a room, and are perhaps more pictorial. Figs. 4 and 5, Plates I and II, are still more so, as they show the corner of a room, or any small corner in a bay-window or caused by a piece of furniture. Fig. 4, Plate I, is more normal and more pliable; in Fig. 5, Plate II, it is rather too abrupt and is specially suitable for the depiction of corners. Where the corner of a room is used, if one wall is darker than the other, point the lens slightly toward the darker side. In living-rooms which, as is generally the case, show a more or less tasteful arrangement of various colors, in tapestries, hangings, oil-paintings, statuary, vases, flowers, etc., orthochromatic plates should be used, if you are in any way particular as regards the proper production of clear values. In places with colored-glass windows such plates are well-nigh indispensable. True enough, all good non-chromatic plates will make home portraits; at the same time, all things in the room that take dark will take the same quality of darkness, or very nearly so, with an ordinary plate, and the white values will be rendered unduly white amidst the gloom. The ortho- or isochromatic plate, used without either screen or filter, will show great differences between the darks in the negative, and will hold down the too-pronounced whites, or at least bring them nearer together as they appeared at the time.

At the Window

A lightly clouded sky is best for window pictures. On such a day, particularly with north light, one can point direct against the window-pane, even when portraying a head. The result will be a clear but flat image. Window compositions are specially suitable for young people. The window shape is generally a pleasant one, and poses easily suggest themselves. The figure can be seated at the window or on the sill, or standing, leaning against the woodwork, or looking out the win-

dow. A part of the window may be open, and the sash, the shade, and curtains will permit any variety of manipulation, and easily yield a homelike effect. The pose itself can be left pretty much to the sitter. People are so used to move about windows that they assume a natural attitude at the slightest hint.

Examples

Fig. 9, PLATE III, is a beautifully lighted picture, and the additional flash was most judiciously used in bringing into relief the most important parts, without disturbing the lower part of the picture. In Fig. 10, PLATE III, the photographer used a very weak flash just to accentuate the cheek and neck. J. F. Sipprell's window pictures, Figs. 17, 43 and 45, PLATES V, XI and XII, were taken in daylight, and are delightfully unconventional in arrangement. The sitters feel at ease, while the young girl in Fig. 19, PLATE V, is posing. The uplifted hand touching the curtain and the turn of the head represent two separate movements, and divide the interest. One becomes conscious of the intention of trying to look graceful. The child in Fig. 20, PLATE V, is well occupied, and for that reason natural-looking. The same can be said of Fig. 18. Dührkoop made the most of a patterned curtain in Fig. 32, PLATE VIII. He arranged a dark tonality with profile lighting on the face against an interesting background, in strong contrast with the blank shape of the window. Light-and-shade compositions can do much toward producing a home sentiment. That a curtained-off window can be utilized as background is shown in Fig. 15, PLATE IV, but it makes a rather indifferent sort of background when, no doubt, so many others are available. The blind in the closed-porch picture, Fig. 36, PLATE IX, resembles a window effect. The back lighting is well managed, and the pose of the two slender figures a most agreeable one. With too much light you get a snapshot effect, as in Fig. 45, PLATE XII.

In the Library

Library pictures are most suitable for men. The flashlight of Edward Everett Hale by Vander Weyde, Fig. 21, PLATE VI, is a perfect record. Nothing less posed can be imagined. Of course, there is a jumble of things. Books

and shelves are apt to fail to compose, and to give a displeasing spotty, effect. A lower shelf with just one row of books, as in Fig. 22, PLATE VI, may produce a more harmonious result. Still, it lacks the virility of Fig. 21. Another difficulty is that libraries are mostly dark and limited in floor space. But it is a room well worth exploiting. The sitters fall easily into a natural, contemplative, or studious attitude; the background has the merit of bearing the stamp of the owner's individuality; so all there is left is the lighting and the obliteration of undesirable areas.

Doorways

A door, whether open, half-open or closed, always composes well with a standing figure. A figure entering (not unlike Fig. 27, PLATE VII), or opening the door, or, after entering, with the knob still in the hand (Fig. 23, PLATE VI) are truly pictorial themes. Just standing at the open door, waiting or in a pose of expectancy, with a flood of light on the front of the figure (Fig. 25, PLATE VII), also offer favorable opportunities. Street costumes are available, and the panel form is a good shape for this kind of composition, as the surrounding architectural features are rather meaningless unless they show an interesting section of the room, as in Fig. 23, PLATE VI. In Fig. 24, PLATE VI, a door has been used as light source for an interior study, such as only Clarence H. White can make. This is unadulterated depiction of home life; it approaches the story-telling picture. But, what of it! Why should not home portraiture occasionally touch upon that phase of art? It is surely more desirable to see now and then a perfect composition than the mere suggestions of pictures.

Curtain Effects

Curtains are particularly useful in hiding the harsh lines of woodwork. As main accessories, they prove a trifle unwieldy. They are, in most cases, too symmetrical in arrangment to look well without a special device, as in Figs. 2 and 27, PLATES I and VII. They have to be pulled out of their regular shape, or animated by a special lighting scheme. If they are a little off color, that is faded, so much the better. They give a more subdued but not less rich effect. The same applies

frequently to the wrong side of the fabric. The photographer must possess some taste and skill in arranging folds to avoid hard and perpendicular lines. They should never fail with realistic severity, glaring at us in a monotony of regularity; but rather be kept indefinite as to line and form. There is no reason to be afraid of dark and shiny drapery. In some instances, it can even be utilized as a reflector for the flesh tints. Curtain compositions have the merit of being picturesque, but they rarely convince by their naturalness. Figs. 26 as well as 2 and 27, PLATES VII and I, are finely conceived, but "posy" all the same.

The Mantelpiece

The mantelpiece is an excellent ornamental adjunct. That it is so rarely used, except for firelight flashlights, is due to its situation in most rooms. What can be done with a position as indicated in Diagram 4? Very little but backlighting. In Fig. 11, PLATE III, we have almost the identical position. There the problem was solved because the room was smaller. The light source was nearer, but even then a reflecting flash had to be applied. A mantelpiece at the other side of the room can be managed only with the local use flashlight or very diffused lighting.

At the Piano

Figures at the piano always convey a pleasant sentiment, unless the bulky form of the instrument furnishes a too conspicuous and disturbing note. A grand is particularly difficult to handle. The less of it seen in the picture, the better. Fig. 31, PLATE VIII, is a charming composition by the Dührkoops. It represents two public performers of old-time music in the costume of the period. The costume helps the pictorial quality, but what should interest us most is the judicious handling of the piano. The keyboard and the music-stands are the only picturesque features about a piano. Why then show more! J. D. Toloff's rendering, Fig. 29, PLATE VIII, has the charm of domesticity about it. It is an incident and scene that might occur in any home. The section of the music-room or parlor is most skilfully represented. The form of the piano is in no way obtrusive; but the same cannot be said of the spotty lights on its polished

surface, and the glitter on the framed pictures. We should be always on the watch to guard against these reflections, as far as possible. Often a glittering patch can be got rid of by moving the article an inch or two. Picture-frames and their glasses are a horrible nuisance in this way. A cork or a crushed-up newspaper placed between the frame and the wall will usually give it enough tilt to get rid of the shine. Brass fixtures, ornaments, fire-irons, and all like things, as well as a good deal of our furniture, need watchful attention. Bear in mind that an object may show a bright reflecting surface when you see it from one place, and not do so when viewed from another.

Cozy Corners

The cozy corner represents frequently the most picturesque spot in the house. The settee in the niche, with the colored-glass window, offers by its few but decided planes an excellent field for standing as well as sitting poses. They should be poses of leisure. The diagonal floor line, with parallel lines in the settee and window-sill, show most corners to the best advantage. The attitudes in Figs. 33 and 34, PLATE IX, are both graceful and well placed. The reclining position of Diagram 6 (after Puyo), however, is preferable, as it is a rule of composition that decided diagonal lines (of the settee, etc.) need other diagonal lines (of the figure) to cross them, to get the most harmonious results.

Absolute dark corners, as in Fig. 7, PLATE II, can be reached only by the use of the flashlight. The lighting of this picture is exceedingly clever, only one high and strong spread of flame on the upper part of the figure being used. The sacrifice of the lower part of the picture was unavoidable with this method. But there is no particular reason for attempting very dark corners unless they compose unusually well. They may, however, have the advantage of not being overloaded with, furniture and so be desirable places.

The Walls

It must have occured to every home portraitist, at one time or other, that the section of a wall without any suggestion of perspective furnishes the simplest and, in most cases, a very suitable background to either a standing or sit-

Diagram 7

Diagram 8

Diagram 9

ting figure. Whistler, in his "Carlyle" and "Mother," absolutely solved the problem for a sitting figure. A plain wall, a few pictures in connection with a curtain, or some wainscoting, will prove sufficient. In standing figures, the painter usually prefers the plain atmospheric background. Home portraitists, as a rule, cannot indulge in such elimination of accessories, but they should remember the lesson furnished by these works of art, that omission whenever possible is a distinct artistic gain. All paneled surfaces make a good though somewhat rigid background (viz. Diagram 7 and Fig. 44, Plate XI). But the design must be pleasing to the eye. It must not show too many lines, and the shapes must be well proportioned. In such cases little else is needed. One generally finds the best effects in wainscoting in the dining-rooms and hallways. All pattern effects in the backgrounds, often produced by window-panes and shades, as in Figs. 18, 34, 36, Plates V and IX, or by curtains and wall-paper, or, as in Diagram 9, by a special device, are truly pictorial in quality, so long as they are kept back in proper subordination to the figure. Even wall-paper of a conspicuous design, as in Fig. 48, Plate XII, can be utilized with impunity if some light and shade division modifies the harshness.

Furniture as a Help

The furniture of a room can be arranged in such a manner that it produces decided lines and shapes. Fig. 35, Plate IX, represents an attempt at this; but there are too many lines and the shapes are too pronounced. At the best, schemes like these possess only a pictorial value; they add nothing to the impression of intimacy and homeliness. Nevertheless, it is well to give it some attention. Diagram 8 shows the average height of the seat and back of a chair, of an ordinary table, the window-sill, and the top of the mantelpiece, in relation to the human figure. It was introduced for no other purpose than to make you think for a moment about this proposition. We all know the approximate height of fixtures and objects about the house, and little is gained by knowing that the average height of a chair is 1 foot, five inches, and that of a table 2 feet, 5 inches. But we should know whereabout these lines cut into a standing

or seated figure. In any premeditated pose, it will help us to carry out our artistic intentions. It is nothing but a study of the proportion of accessories in relation to the lines and forms of the human body. In photographing straight-line arrangement of any kind, it is a strict necessity that the camera should be perfectly horizontal. As no great contrast of light and shade is wanted, the time of exposure should be reckoned according to the darkest part of the wall to be taken.

Using a Stairway

The lower steps of a staircase are much in favor for bridal pictures. It is like putting a model on an artist's platform. It gives a sense of dignity that suits the occasion. Also, small women are frequently posed this way, as it makes them look taller. It works very much like the device of bringing the train round to the front, which makes even a short person tower erect like a veritable Juno. (See Diagram 7.) It is strange that in bridal pictures the groom is never in evidence. It is considered too sentimental, although foreigners show a predilection for depicting both bride and groom on one picture. Burnell in Fig. 28, PLATE VII, endeavored to solve the problem. The idea is good, but not carried out with sufficient skill in regard to its arrangement to convince us of the desirability of this innovation. Staircase pictures can rarely be taken with daylight alone, unless there is a landing with a window. Pierce utilized such a source of light very cleverly in Fig. 30, PLATE VIII, as the main illumination. The window behind the girl's head was originally a picture. Fig. 13, PLATE IV, shows an unusual pictorial effect taken in daylight.

Odd Places

There are many odd places about every house, in niches, alcoves, vestibule, corridors, etc; but they should be avoided rather than sought. The lighting is usually complex, and may result in a lot of trouble and doubtful results. They may be novel and interesting and do for experiments, but, unless the photographer has a trained eye for pictorial effect and is expert in lighting, it is wiser to rely on more ordinary arrangements.

Conservatories built on the greenhouse principle have a sufficient volume of light, but generally lack

space. It is only in large residences that they are available, and then only on certain hours of the day. The light is too sunny and diffused. By turning the face toward the entrance, as in Fig. 37, PLATE X, you may get a satisfactory effect of shadow lighting.

The Porch or Veranda True and characteristic portraits may be produced on the porch, but it is necessary to control the unlimited amount of light. Direct sunlight is good only for snapshots, so we have to place the sitter on the shadow side of the house. The wall acts as a curtain shutting off the light from one side, the roof limits the toplight; but still a flood of light will enter in a half-circular fashion. A background or some screening-off at one end of the porch is almost unavoidable. That a satisfactory result can be obtained even in legitimate portraiture (which is always a supreme test) is seen in Fig. 38, PLATE X. The light falls sideways, but is well distributed. There are no straight shadows across the face. Another good position is indicated in Fig. 39. It is double lighting on the shadow side of the house in the late afternoon. The background is faked. The entrance of the house often offers the opportunity to get a part of the face and figure into shade (Fig. 46, PLATE XII); but the architectural features must be interesting, as they occupy the largest part of the picture area.

Out-of-Doors Portrait effects out in the open in broad daylight are often either too contrasty or too flat. The immense expanse of light adapts itself only to figures engaged in open-air pastimes, or scenes where action or attitude furnish a special interest, as in Fig. 47, PLATE XII, a characteristic interpretation of Ruth St. Denis in her peacock dance. You will find it almost impossible to get any particular points of light that will stand out more clearly than others. Of course, light draperies and light portions of the subject will reproduce light, and dark parts will be dark in the photograph, but there will be no perceptible relief or roundness. (Fig. 40, PLATE X.) The horizon line should be naturally a good deal below the level of the head (except in eccentric compositions), yet it can be higher than in most painted backgrounds.

A picturesque straight background can sometimes be found out-of-doors, and help to make a picture, may it be an ivy-clad wall or just a trellise with the leaves of some climbing plant. Never forget that everything in and about the house is at your disposal. There should surely be no lack of some bit of pleasing environment.

The Nursery For children, almost any room with a reasonably-sized window will do. If there is any nursery, it is preferable, as in most cases it is of generous size, well lighted, and not overcrowded with furniture. A child's portrait should be simple in treatment and surroundings, spontaneous and, above all, unconscious, both in expression and pose. The nursery is generally papered in light colors, but, if the pattern is in any way obtrusive, a background may be necessary. A rollable background with its two sides of different shades would serve the purpose, if it is kept free from creases; for a background should not assert itself as such. It should either appear as a mere tone in the print, or else as the surface of a wall. Rolls of brown or gray wall-paper, thumbtacked to the wall, make an excellent background.

Table, stool, and toys are necessary adjuncts, and no doubt at hand. They are a decided help. For, with a fishpond or a few bricks, the little sitter will often remain in one place for a fairly long time, perfectly content and absorbed. With bigger children, better results are obtainable if they are quietly chatted to. Any hint at posing, especially with boys, renders them conscious at once. The more the youngsters are induced to amuse themselves, the better, of course; the entertainment should never be of the fast and furious type. The chief aim is to keep the child normal, even to entire forgetfulness of the camera (for that reason a silent studio shutter is indispensable), and if this is accomplished the operator has gained his point. With quite young children, it is advisable to spread a light rug or white sheet on the floor, and, by placing a little table with toys on it, making it a sort of special playground. The youngsters will quickly get to look at it as their own particular domain; and, even if they take excursions about the room, they will return as a matter of course,

and this will bring them back with a new and probably delightful attitude.

Full-length portraits of these little folks are usually much more satisfactory than attempts at head studies, for their character is seen as much in their bodies as their faces; and, if they are naturally portrayed, as in Fig. 42, PLATE XI (one of those incidents that are sure to please), a picture that shows the whole of them is a far more faithful and conclusive record of their so quickly changing personalities. You may argue that this can also be accomplished in the studio. Not quite; children, after all, feel more at ease in their own homes, and it is almost certain that they do wear their "best" clothes when they visit the studio. New and starched garments have no place in the nursery.

Whether a diffused style of interpretation, keeping everything delicate and light in tone, is preferable to shadow rendering, is entirely a matter of taste. A young child's soft skin and smooth flesh, its melting planes and rounded contours, lend themselves equally well to either treatment. Technically, the flat arrangement of lighting in Figs. 43, 44, PLATE XI, will surprise many, as showing with how short an exposure it is possible to obtain a fully exposed negative.

Finis

Home portraiture means strenuous work, but it is considered an enthralling pursuit by nearly all who follow it. Slowly but steadily it has come into its own. Its opportunities widen with every day. It has now its purely utilitarian value as a profitable profession. In the beginning, when it was in the hands of amateurs, the main ambition lay in the direction of more pictorial results. It is doubtful whether some of the compositions of the early workers will ever be excelled. Still their craftsmanship, though never without merit, was negligible at times. It was a period of experimentation. Then the professional entered upon the scene with his trained knowledge of lighting, conventional posing and getting a likeness. He made it more practical, and his business sense helped to make home photography an all-the-year-round occupation. The two elements complemented each other.

Whoever possesses the necessary technical knowledge and taste for art, coupled with the special gift to grasp and enter into the intimate charms of home life, will do well to take up this fascinating line of work. For under no studio conditions are skill and knowledge so put to the test, and at the same time so certain of sympathetic results. It is the wonderful interchange of pictorial suggestions and live human interests between photographer and sitter that adds a new note, not only to photography, but to the art of portraiture.

Sidney Allan.

Notes and Comment

Mr. Thomas Harrison Cummings who, years ago, with Mr. Juan C. Abel, founded the "Photo-Era" at Boston, and who later edited several photographic publications, which have since gone the way of all flesh, is now associated with the "School Arts Magazine" of Boston. This remarkably interesting magazine is devoted to the teaching of drawing and allied arts, as part of the work of the public schools. It is now about to exploit the teaching of photography in the schools, as a help in the visualization of those dry facts with which the school-books have for centuries puzzled the youthful seeker after knowledge. By his wide experience and technical knowledge, Mr. Cummings will undoubtedly prove his peculiar usefulness in this new field. Photography in the schools has been for many years a hobby with Mr. Cummings. May his dream come true.

Readers of The Photo-Miniature should not overlook the Kodak Advertising Slogan Illustration Competition, in which three thousand dollars are offered in cash prizes. A descriptive circular giving the conditions of the competition may be obtained from any Kodak dealer, but I may repeat here that this competition is for photographs illustrating any one of the five following slogans: 1. Take a Kodak With You. 2. All Outdoors Invites Your Kodak. 3. There are No Game Laws for Those Who Hunt with a Kodak. 4. Let the Children Kodak. 5. Write It on the Film—at the Time. For the first and second best photograph illustrating any one of these slogans, the Eastman Kodak Co. will pay $300 and $200 respectively. Class

No. 6 offers a special prize of $500 for the best new slogan, together with a picture illustrating the same.

The work involved in this competition is exceedingly interesting and worth taking up for its own sake, apart from the very substantial awards offered for the successful pictures.

The London Salon of Photography opened September 7. The experiment is being tried this year of receiving unframed prints for exhibition, an innovation which most exhibitors will welcome. I hope to give some account of the Salon in my October issue.

"The Bulletin of Photography," published at 208 North 13th Street, Philadelphia, is a weekly journal for the professional photographer, full of live reading matter and instructive illustrations, covering the technical and business sides of photography. The subscription price has been reduced from $1.75 to $1.50 per year, postfree.

The Eastman Kodak Company, Rochester, N. Y., has been awarded the following prizes at the Panama-Pacific International Exposition 1915, by the International Jury of Awards: 1. The Grand Prize for Hand Cameras. 2. A Gold Medal for Kodachrome Plates and Photographic Supplies and Equipment. And, 3. A Gold Medal for Photographic Papers.

The Sisters
Rudolph and Minya Dührkoop
(From a print on Japanese tissue)

W. E. Burnell

W. E. Gledhill

The Misses Wiborg
Henry Havelock Pierce

The Photo-Miniature

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Photographs on Watch-Caps and Dials, Spoons and Coins; Imitation Enamels on Chinaware and Metal Plates; Miniature Photographs for Charms and Specialties; Printing and Enlarging on Silk and Other Fabrics.

Running off from the broad highway of everyday photographic work, with which all the world is familiar, there are many byways or, in plain English, many minor photographic processes, in which a few workers here and there have found a profitable outlet for their photographic knowledge and skill. These minor processes are better known and more commonly used in Europe than in our own country, but there is an increasing desire for a practical knowledge of them among American photographers, as my correspondence testifies year in and year out. To meet this desire, I have sought out a practical worker of the old school, who has had experience in these processes, and from his notebook I have taken the methods and formulas given in the following pages.

It may be that many will find some dry reading in the carefully detailed description of the working of the processes given. It is more difficult to describe the carry-

ing through of a technical process than to do what is described in practice. I have made the methods as interesting as possible, and can assure the reader that they are all less tedious in the actual doing than in the reading of the text. Their practical value must and will justify the tediousness of my description.

As here given, the methods are adapted for use by commercial workers who are equipped, or are willing to equip themselves, for the handling of many different conveniences in the way of apparatus and material. The reader who essays any one of the methods on a small scale should first of all figure out just what his experiments will require, in order to avoid too elaborate preparation and an accumulation of materials over and above his needs.—[Editor].

PHOTOGRAPHS UPON WATCH CAPS, DIALS, SPOONS AND COINS

The making or transferring of photographs upon watchcases, watch-dials and the like, has come to be a very profitable sideline with professional and commercial photographers. But there is nothing about the process which is beyond the capabilities of the amateur, so that the method is one which may interestingly be described in these pages. The process and formulas which follow are those employed by a practical worker in this branch of photography for many years, with complete success.

Carbon Prints Are Used

First, we need a small supply of carbon tissues such as are used in the carbon printing process. These are obtainable in many different colors, but brown-black, portrait-brown, chocolate-red and engraving-black are the colors most generally favored and used for prints on metals. Such as aluminum, and silvered copper plates.

The Sensitizer

A suitable sensitizer for these tissues should be prepared ready for use. The following sensitizer gives a very clear image and one which is easily developed: Water, 32

fluid ozs.; potassium bichromate, ½-oz.; ammonium bichromate, ½-oz.; ammonium carbonate, ½-dram; glycerine, 2 drams. This solution must be kept in an amber or orange-colored bottle, and the sensitizing of the tissue carried on in yellow light, the sensitizing solution being filtered before use by passing it through a plug of absorbent cotton placed loosely in a glass funnel. It is essential, in all these processes, to take the greatest care against dust and dirt.

A Drying-Closet

A small drying-closet is necessary for this work, not only to dry the sensitized tissue, but also for drying the watch-caps or other articles when the picture image has been developed upon them, as well as for the final drying after the articles have been lacquered. Such a closet or oven can be obtained at most gas-appliance stores. It should be about 3 feet high and 2 feet wide by 18 inches deep. Two or three strands of copper wire should be affixed from side to side, near the top of the chamber, from which to suspend the wet sensitized tissue for drying. A few holes should be bored at the bottom and top of the closet to admit of ventilation, but these should be covered or protected so that no white or actinic light may enter.

Kind of Negative

Although wet collodion negatives are admirably suited for this process, and are generally employed by commercial photographers, they may be regarded as out of the question for our use here. The miniature negatives generally needed can be made on gelatine dry plates, the brand known as process plates being especially suitable, giving snappy, brilliant negatives, with a fair amount of contrast in the tones. The soft, detailful qualities of a good portrait negative are not suitable for this class of work.

The Camera

Any camera with a reasonably long extension-bellows capacity may be used for the copying or reduction work, preferably fitted with a lens of short focus, about 5 inches. The plateholder should be one such as is used in wet-plate work. The negatives used must be reversed negatives, since the carbon-printing method employed

is the single transfer process. To make these miniature reversed negatives, a prism is used in connection with the lens, and the little negatives are cut from a 5 x 7 plate with two gauges. This is necessary, because the plate must be cut under a ruby light (in the darkroom); one gauge serves to cut a dividing line in the length of the plate, while the other divides the plate in two cuts, one from each end, the size of the plate thus obtained being 2½ x 2 5/16 inches full. A kit for the plateholder should be provided to take a plate of this size, resting only at the corners. The focusing screen of the copying camera must be of extremely fine grain, such a screen being ground with fine flour emery, known commercially as a "mud ground glass."

Copy Negative

The miniature negative is made by the usual copying method, but, if a prism is used, the original photograph is fixed at right angle to the camera on an upright board placed in front of the camera. The reflected image given by the prism is now carefully focused to the size required, and the exposure made as usual. A very small stop is used in the lens and, with a normal subject in a reasonably good light, the exposure will be about one minute.

Preparing the Developer

The developing solution, prepared beforehand, is made up as follows, in three separate stock bottles: *Stock Solution A*: Hot distilled water, 32 fluid ozs.; metol, ½ oz.; shake until the metol has all dissolved, then gradually add, with stirring, 2½ ozs. sodium sulphite (dry); shake until complete solution is obtained. *Stock Solution B*: Hot distilled water, 32 fluid ozs.; sodium sulphite (dry), 2½ ozs.; hydroquinone, 1 oz. *Stock Solution C*: Hot distilled water, 36 fluid ozs.; potassium carbonate, 8 ozs. A 10 per cent solution of potassium bromide is supposed to be at hand ready for use with the above, if required.

Development

When the plates have been exposed and are ready for development, the developing solution is made up for use as follows. The developer, of course, is used cold. Take of *Stock Solution A*, 2½ ozs.; *B*, 2½ ozs.; *C*, 3½ ozs. Add 35 drops of the 10 per cent potassium bromide

solution and 10 ounces of distilled water. Shake this mixture well before use. It may be used repeatedly, only a small quantity being used for the development of each plate. It is advisable to develop the miniature negatives one at a time.

Take a 4 x 5 hard-rubber tray, place the exposed plate in this, face up, and pour on say 3 ounces of the developer with an even sweep of the solution. If the exposure has been correct, the image will quickly appear. See that the whites of the plate hold their color. If they veil over, the plate has been overtimed, and another exposure should be made. With correct exposure, the image will develop progressively, reaching full intensity in the high lights without any veiling of the whites of the negative which represent the shadows in the subject.

As soon as the development is complete, rinse the negative under the tap and fix it in the following fixing solution, which will give a brilliant clear image.

Fixing Solution

Prepare *A:* Water, 48 fluid ozs.; hyposulphite of soda, 16 ozs. Stir thoroughly till dissolved. Prepare *B:* Water, 8 fluid ozs.; chrome alum, 1 oz.; *C:* Add 60 drops sulphuric acid to 2 ozs. of water. As soon as the chrcme alum has thoroughly dissolved, add *Solution C* to *B*. Stir the mixture well and add it to *A*. Filter this through either filtered paper or absorbent cotton, after which it is ready for use in a scrupulously clean tray. A 6½ x 8½ enameled-iron tray is very suitable for the fixing-bath, the fixing solution in use being renewed from the stock solution as it is seen to be exhausted.

The negative should be allowed to remain in the fixing-bath for fully ten minutes. Should there, after fixing, be a slight bloom upon the negative, do not consider this, but wash the negative well and wipe it with a tuft of wetted absorbent cotton. This will free the plate of any specks of dust, as well as surface streaks caused by the developer.

The negative should now be placed in a tray of water and allowed to soak, the water being changed several times during twenty minutes, after which the plate should be placed upon one edge on blotting-paper to dry.

Note Re-focusing

Generally, in this class of work, a number of these miniature negatives are made from different photographs and treated at the same time. When a prism is used, which is invariably done where the single transfer carbon process is employed, the prism is fitted upon the lens-hood, the photograph to be copied being placed at right angles to the camera, so that the focusing is made from the reflected image of the prism. There is no difficulty at all in the use of a prism as here suggested. The reduction in the size of the portrait or original copy is made by withdrawing the camera at right angles from the print and focusing in the usual way. The picture image must be focused perfectly sharp with the lens at *f*/8. Before exposure, the lens is stopped down to *f*/16 or *f*/32. A little experience will determine this point. Should any difficulty be experienced in obtaining a sharp focus of the original, use a sharply printed letter or figure, such as is produced by copper-plate printing upon white paper or bristol-board. This is attached to the original to be copied by means of a pin, and the sharply cut letter will form a convenient focusing guide in all the subsequent operations. Any similar device which will give a figure permitting convenient and sharp focusing will serve.

Masks for Printing

Having obtained the miniature negative desired, we now prepare a number of such negatives for printing. The printing-frames used for this purpose are 4 x 5. Two pieces of orange-colored paper are cut to the size of the negative, and inscribed with a circle made with a compass and lead-pencil, to a size slightly less in diameter than the watch-cap or dial to which the photograph is eventually to be transferred. This mask is to be fitted upon the face, or film side, of the negative. Now cut out another circular mask, a little smaller in diameter than the first. This must be fitted upon the front, or glass side, of the negative. The object of these two masks is to produce a "safe edge" to hold the carbon image to the metal of the watch-cap, or to the face of the dial, during development. A touch of paste at each corner of the masks will hold them in position.

The Vignette Form

The negative is now placed at the center of a clean 4 x 5 glass plate, and held in position by two strips of gummed paper at the top and bottom opposite corners. The plate is turned over, placed in a retouching desk, and stumped so as to form a vignette. This stumping is done by cutting half-way down a smaller circular or flat bristle brush, dipping it into moistened opaque, and pressing this end on to the glass, so as to form a rugged-edged oval, which will give a vignetted effect in the print. When the glass plate bearing the negative is so stumped and dry, a piece of tissue-paper may be attached to the front of the glass covering the vignetting, and held in position with a touch of paste at the corners. Over the head of the figure (presuming the picture to be a portrait), upon the orange paper mask, the letter T is marked, indicating the top.

Sensitizing the Tissue

Pour into a clean hard-rubber or porcelain tray a few ounces of the sensitizing solution, made up as already described. Have ready two or three pieces of carbon tissue, 5 x 7 inches. Protect the fingers with rubber finger-tips, and immerse a piece of the tissue (after wiping the surface carefully with a dry cloth) in the sensitizing solution. Pass the tissue into the sensitizer, face up, which will obviate the formation of air-bubbles upon the surface of the tissue; then turn it over, taking care to press it beneath the liquid. At first the tissue will curl slightly. Flatten it with the finger-tip and in about two minutes it will lie limp and flat of itself. Now remove the tissue, lay it face down upon a cold, clean sheet of glass, place a piece of blotting-paper over it, then a piece of thin rubber sheeting over this, and apply a soft 4-inch rubber squeegee, stroking the cloth well all over, so that the surplus sensitizing solution will be removed from the tissue and absorbed by the blotting-paper. Remove the cloth and blotter backing, wipe the back of the sensitized tissue with a piece of clean cloth, clip one end with two wooden clips, place a small thin strip of wood or glass at the other end, and clip this to the back of the tissue. Now lift the tissue from the glass plate and suspend it to dry in the drying-closet

already mentioned. Weighted and clipped as here described, the tissue should dry flat without curling or buckling. The unused sensitizer may be returned to the stock bottle for future use.

Preparing for Printing

The sensitizing of the tissue and all after operations should be done in yellow light. As soon as the tissue is dry, take one of the sensitized piece and cut a thin circular cardboard gauge that will fit the circle upon the negative, place this gauge upon the sensitized tissue and cut out a circular piece of the tissue with a scissors. Now place this upon the negative so that it comes within the circular mask, then, on the back of the tissue, mark that part T, to correspond with the mark T on the paper cut out. This will indicate the top of the print, so that it may be placed in the correct position when transferring the picture to the watch-dial or watch-cap. Without this guide, the portrait might be transferred upside down or at an angle, instead of erect in the correct position on the cap.

Printing the Picture

In place of the usual sensitometer, used in carbon printing, a portrait negative of the same quality as the little negative to be printed from may be used. This guide negative is placed in another 4 x 5 printing-frame and a piece of any print-out paper placed thereon. The two frames, the one bearing the guide negative and print-out paper, the other bearing the miniature negative and the sensitized carbon tissue, are now put out to print together. If the printing is done in bright sunlight or by the electric arc, the two printing-frames should be covered with tissue paper. If printed in daylight, without sun, the tissue covering may be dispensed with. After the frames have been exposed to light for five minutes, the print-out paper under the guide negative should be examined, and if the print appears to be about one-third as deep as it would be in an ordinary finished print-out photograph, the carbon tissue in the other frame may be presumed to be sufficiently printed. At all events, the carbon tissue under the miniature negative should be exposed to light until the guide print has reached the depth indicated. If a number of

carbon prints are being made at one time, they should be removed from their printing-frames as soon as sufficiently exposed, and kept flat and away from light and air by storing them in a printing-frame between two glass plates. They should not be kept too long, however, before being developed, because in the carbon process the action set up by light in the sensitive film continues slightly, although the exposed tissue be kept in the dark. Where exposed carbon prints are to be kept for several hours before developing, this continuing action of light must be allowed for, or the prints will be too heavy and dark when they are developed.

Cleaning the Watch-Cap

The watch-cap or lid should now be prepared to receive the picture image. If the surface of the cap is to be left bright, it should be cleaned with a solution of common lye, made by mixing 2 ounces of commercial lye (such as can be purchased at any grocer's or paint store) in a pint of water, and kept in an earthenware bowl. Apply this with a small mop made by pressing a tuft of absorbent cotton into one end of a piece of half-inch stiff rubber tubing. The cap, or brightly polished lid, is placed in the lye solution, being held by a wooden clip which possesses a strong spring. So held, the cap is wiped well with the mop until the wash-water holds or clings uniformly all over the surface, when it may be judged to be thoroughly clean, and placed in a tray of cold water until needed for the transfer of the picture.

The Matting Process

If the watch-cap or lid is to be matted, or given a soft, dull surface before the picture is transferred to it, a special apparatus will be required. This matting of metal surfaces is done by the use of a small bellows, worked by one foot, giving a jet of air, under considerable pressure, blown through the apparatus, which is shown in Fig. 1. In the diagram, the vertical cylinder *A* contains either dry-washed fine sand or a coarse pumice powder, which descends through the tube *B*. *C* represents a piece of rubber tubing to join the stopcock *D* with its tube to *B*. The stopcock *D*, with a short piece of brass tube soldered at each end, is attached to the blowpipe *E*, inside of which is a short metal tongue soldered to *D*, upon

which the sand or pumice falls, and is carried through *E* by the force of air by the pipe *G*, which in turn is connected with the foot-bellows. The cap, or lid, to be matted is held in front of the nozzle of *E* by the left hand, while the air is blown from the bellows, worked by the right foot. The kind of foot-bellows employed is shown in Fig. 2. The passage of the air through *E* beneath the tongue *F* sucks the sand or pumice from *A*, which mingling of the air forms a miniature sandblast. The watch-cap or lid should be turned around in the hand during the operation of the matting, so as to produce an even result. Having this apparatus at hand, the process of matting is completed in about one minute. As soon as it is complete, the remaining dust upon the watch-cap or lid may easily be blown off with a puff of air from the mouth. The watch-cap is then cleaned in the lye solution, as already described, and placed in cold water until it is ready to receive the carbon transfer picture. A number of caps can be prepared at the same time in this manner.

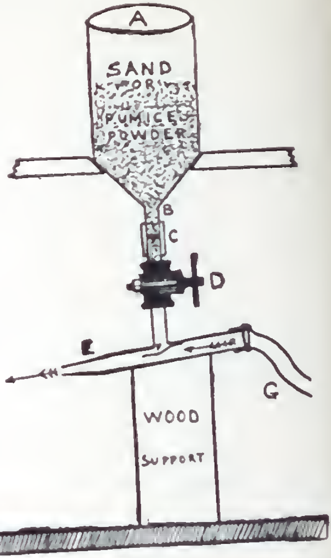

FIG. 1.

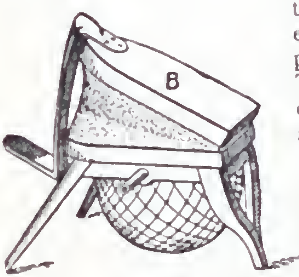

FIG. 2.

The Substratum To prepare the matted watch-cap or lid for the transfer of the carbon print, it must be coated with a substratum, prepared as follows: Water, 4 fluid ozs.; Heinrichs hard gelatine, 50 grains; chrome alum, 5 grains. The chrome alum should first be dissolved in one ounce of boiling water. The gelatine, after washing for fifteen minutes in cold water, should be thoroughly melted by the aid of heat and, while still hot, the chrome alum solution is added, a few drops at a time only, the mixture being well stirred with a strip of glass during the addition. Now add to the mixture 30 drops of a 10 per cent solution of carbolic acid, then strain the mixture through muslin into a 6-ounce wide-mouthed bottle.

An Alternative Matting By the use of the following method, the air and sand-blast apparatus may be dispensed with. It gives a white coating to the surface of the watch-cap or lid, on which the carbon picture is later transferred.

Dissolve a small quantity of white opaque glue in water, by first soaking 1 ounce of this glue in 5 ounces of cold water for an hour. Then heat the mixture by standing the vessel containing the soaked glue in hot water, and stir it gently so as to obtain a uniform mixture of glue solution. If at hand, take a hot solution of chrome alum made by dissolving 10 grains of chrome alum in ½ ounce of hot water. Add this to the glue solution, and then add 2 drams of a 10 per cent solution of carbolic acid. Stir this mixture well, and filter it into a warm glass tumbler by squeezing it through a piece of chamois leather, by twisting the leather and its contents with both hands, so as to force the glue through the pores of the leather. Having the lid or cap already cleaned, pour a small quantity of the glue into the lid, drain off the excess solution into the tumbler, then let the watch-cap or lid lie level upon a piece of glass until the coating has become set and dried. As soon as the print has been made ready for development, coat the dry watch-cap or lid with plain collodion and drain, just as in the case where the matting is done by sand blasting already described. The wetted carbon print is now placed, face down, upon the collodion coating,

pressed well into perfect contact, and developed just as is about to be described for the after-treatment of the sand-blast method.

The color of the coating given by this glue mixture, when dry, will present a fine opalescent matted surface, giving a very suitable base for the carbon print.

Coating with Substratum

Take the watch-cap or other matted article which is to be coated, from the tray of cold water in which it was placed after being matted, drain off the surplus water, then pour the hot substratum mixture into the lid or upon the cap, so as to get an even coating, drain off the excess into the stock-bottle, give the article a little shaking, so as to eliminate all excess of substratum, then place it upon a strip of blotting-paper to dry. Do not disturb the article while drying, as a shifting of the substratum will cause a line across the article that cannot be removed. Once placed to set and dry, the coated articles must so remain until perfectly dry, after which the watch-cap or lid is ready for the transfer of the picture.

Collodionizing before Transfer

Just before the transfer of the carbon picture, however, the watch-cap or lid, coated as above, must receive a further coating of plain collodion (not the amyl acetate kind). This coating is given by pouring a little of the collodion into the watch-cap, rocking the cap or lid to and fro from the hinged side, so as to drain off the superfluous collodion and obtain an even coating. This operation should be carried through quickly. Now place the article in a tray of clean cold water. If more than one watch-cap is to be treated, they may be done in the same way and at the same time, letting them remain in the water until all the ether and alcohol have been washed out of the film, which will take not more than five minutes.

Transferring the Picture

Having at hand a number of the pieces of exposed carbon tissue, take one of the exposed tissue discs, place it in another tray of clean water and keep it beneath the surface until it lies perfectly flat, now remove it and place it gently, face down, into the watch-cap or upon the lid, seeing that the T mark on the back of the tissue

comes at the top of the cap. Press the tissue at the center with the tip of one finger. Remove the cap or lid and its adhering print from the water. Press the tissue down all around with the thumb of one hand, then take a clean towel or finger napkin, allow a corner of this to be pressed between the thumb and the tissue carefully, pressing the tissue gently all around until the whole of the disc is in perfect contact with the watch-cap or lid. Treat the other watch-caps at hand in the same way. They will then be ready for development.

Developing the Carbon Image

Take a deep tray, 10 x 12, either hard rubber or enameled iron, half fill it with warm water, and place the watch-caps and lids in the water at one end of the tray. Cover the tray with a glass plate to keep the heat in. In the course of a few minutes, pour some very hot water into the tray at the end opposite to the watch-caps, rock the tray a little so as to disturb the hot water, and cover again with the glass plate. It will now be seen that the coloring matter of the tissue is oozing out at the edges of the discs attached to the watch-caps. When this occurs, take hold of one of the caps, push the disc of tissue lightly with one finger either at the top or bottom, and with a pair of tweezers grip the loose end of the tissue, and quietly lift the tissue away from the watch-cap. Now treat the other caps in the same way. Sometimes the paper backing of the tissue will float off its support without any lifting.

Now take one of the watch-caps between finger and thumb, holding it by its edges and not touching the surface, and wave it gently to and fro under the warm water. Or, take a small glass tumbler in the right hand, half fill it with warm water and, holding the watch-cap in the left hand, gently pour the warm water over the gelatine image on the cap. The development of the image will be seen to take place, and make rapid progress during this laving of the water over the article.

The Alum Bath

As soon as the picture image is seen to be developed, place the article in a tray of clean cold water, and then place it in a clean tray containing a filtered 3 per cent solution of common alum. Let the developed pictures remain in

the alum solution for 5 minutes, after which remove them to a tray of water, or rinse them under a gentle stream of water from the faucet and then stand them upon clean blotting-paper to dry in a closet away from all dust. The faucet from which the water is supplied for these operations should have a few folds of cheese-cloth or butter-cloth tied around it, to form a sort of filter, preventing dirt or drops of iron-rust from the supply-pipe falling upon the developed picture.

Spotting

When the watch-caps or lids bearing the picture image are quite dry, they should be carefully examined. If the picture image requires any spotting or finishing with color, this should be done now, after which the cap will be ready for lacquering.

Lacquering the Picture

Having a few watch-cap pictures developed, dried, and spotted, we are now ready for the lacquering, which is to preserve the print from injury by abrasion, etc. For this process, pour a small pool of amyl acetate collodion all over the surface of the print, holding the watch-cap in the left hand, and draining the excess of collodion back into the pouring-bottle. It will be found that this collodion runs somewhat sluggishly and will require about one minute to thoroughly drain the excess from the article coated, which should now be placed on edge upon blotting paper to finally drain. Getting rid of the excess collodion from this coating may be aided by the use of little strips of blotting paper, cut about 3/8 of an inch wide, and torn across to form a diagonal tip. This tip is touched to the point where the collodion is draining from the article and absorbs the excess collodion.

When the first coating of collodion has quickly dried, a second coating is applied. This coating should be drained from the opposite side of the article. When thus treated and thoroughly dried, the picture will be proof against damp, acids, and alkalies, and will stand a great deal of rough wear and usage.

Vignettes for Watch-Dials

The picture image for the little vignette portraits placed on watch-dials is made much smaller than if intended for the watch-cap or lid. A reversed negative is first

made with the prism, if it is desired to have the image in the position of the original. If this is not necessary, the miniature negative may be made by direct copying. It is mounted and vignetted in the way already described on an earlier page, except that an elliptical or oval cut-out is used on the negative instead of the circular mask.

The watch-dial must be removed from the watch for the carrying out of this method. Any watch-maker will do this for a trifle.

Cleaning the Dial

The dial to be printed on is carefully cleaned with the lye solution by wiping it with cold lye, using a small cotton mop. It is then rinsed under the faucet, and a small quantity of the gelatine solution already mentioned is poured over that part where the print is to be, generally in the space between the figure 12 and the center of the dial. An extremely thin coating of substratum is all that will be required. After this application, the dial must be stood on edge to dry.

Transferring the Print

The making of the carbon print is carried through as already described. That part of the watch-dial which is to receive the image is now coated with plain collodion, drained quickly and placed in cold water. The small oval piece of printed carbon tissue is also placed in a tray of water, and, as soon as it lies flat, it is removed and placed, face down, upon that part of the watch-dial prepared for the transfer. Take care that the mark T, which indicates the top of the head of the portrait, is placed toward the top of the space on the dial. The tissue is then pressed gently down upon the face of the dial, and the collodion and substratum surrounding the paper support of the print is wiped off while the print is held in position under the thumb.

Development and After

The developing of the picture image is now done as described in the process for watch-caps. If a little coloring matter still clings around the edges of the picture image, this may be eased off by the careful use of a small camel's-hair brush, well wetted in hot or warm water. The washing, aluming and lacquering of the picture on the dial

are done just as described for caps and lids, except that the whole of the dial, and not only the picture image, is to be covered with the amyl acetate collodion. This method, as given, is intended for the usual white enameled watch dial.

Treating Matted Silver Dials

When a matted silver dial is to be dealt with, a slightly different procedure must be followed, in order to avoid the slightest marking of the dial.

Take the silver matted dial and dip it first in warm water and then into a mixture of pure alcohol and water in equal parts. Rinse quickly in cold water (do not rub it at all) and coat with a warm solution of gelatine of about 20 grains gelatine to the ounce of water. Pour this solution over the dial twice, drain a little, then place the dial, face up, upon a 4 x 5 glass plate, carefully leveled, to dry, away from every trace of dust.

When the gelatinized dial is dry, place it in a solution of formalin, consisting of ½ ounce of formaldehyde in 10 ounces of water. Let the dial remain in this for five minutes, then remove and, without washing, stand it on edge to dry. As soon as it is dry, rinse it under the faucet for a minute or two, then dry again, after which it is coated with amyl acetate collodion and dried once more. With this preparation, the dial is ready to receive a miniature carbon print, without fear of any injury to the dial.

The little vignetted portrait is printed on carbon tissue, just as described in the earlier processes, transferred to the dial, and developed in warm water, alumed, washed, and dried in the way already described. After this, it is again coated with the amyl acetate collodion, which completes the operation. A vignetted portrait on a watch-dial is usually charged for at a higher rate than an ordinary watch-cap picture, because of the extra labor needed to preserve the dial from injury.

Transfer Prints on Watch-Dials

The miniature negatives used in this method need not be reversed, but direct copies made in the ordinary way in the copying camera. As I know of no transfer or stripping collodion print-out paper in the market at present, I will give the method of preparing the paper.

The Emulsion The following solutions must be made up in separate bottles, and the worker should have two 16-ounce amber-colored bottles at hand, one for the final mixing of the three solutions to form the emulsion, and the second for the stock-solution bottle in which the filtered emulsion is finally kept.

Prepare: (*A*) Pyroxylin (soluble cotton), 50 grains; photographic alcohol (pure), 4 fluid ozs.; sulphuric ether, 4 fluid ozs. (*B*) Distilled water, ½ fluid oz.; nitrate of silver (re-crystallized), 240 grains. (*C*) Pure alcohol, 2 fluid ozs.; chloride of strantium, 64 grains. (*D*) Pure alcohol, 2 fluid ozs.; citric acid, 64 grains. Having prepared these as directed, pour into one of the amber-colored bottles 2 ounces of solution *A*, add 30 drops of *B* in 1 dram of pure alcohol, and shake the mixture well. Add to this 1 dram of *C*, a few drops at a time, shaking the mixture well after each addition, and add 30 drops of *D*. Shake this mixture vigorously and filter it into the second amber-colored bottle in yellow-colored light. A plug of absorbent cotton loosely pressed into the neck of a small glass funnel should be used for the filtering, and the filter must be covered with a glass plate during filtering, to prevent the evaporation of the ether. This print-out emulsion will keep for a moderate time before use, say six months.

The Transfer Paper The stripping paper to be used as a support for the print must be prepared as follows. Take several sheets of baryta-coated paper, about 8 x 10-inch size, and mark the back of each sheet with a lead-pencil. Now prepare a gelatine solution as follows: Distilled water, 12 fluid ozs.; gelatine, 180 grains; white granulated sugar, 1 dram. The gelatine is first cut into strips and soaked in part of the water with the sugar for a quarter of an hour. The vessel is then placed in hot water, the remainder of the quantity of water given in the formula added, and the mixture stirred until a smooth gelatine solution is obtained. This is now passed through a clean piece of muslin into a clean tray, that has been previously made warm by filling it with hot water and emptying. The sheets of baryta paper above men-

tioned are now floated, face down, upon this warm gelatine solution until they lie quite flat on the surface of the solution, after which they are lifted from the solution, drained from one corner and suspended in a drying-closet to dry away from all dust. Paper thus gelatinized will keep quite flat and in good condition for sensitizing if placed between two pieces of glass in an 8 x 10-printing-frame.

Coating the Emulsion

Cut one of the pieces of gelatinized paper in half, to form a sheet 5 x 8, fold up the outer edges of the paper about one-quarter of an inch all around, so as to form a tray with the gelatinized surface of the paper as the inside of the tray. Adjust the paper at the two opposite corners to form two lips, then fix this to a sheet of cardboard with a touch of sealing-wax, so that it will form a workable tray without bending in the hand. Now, in yellow light or in the darkroom, pour a small quantity of the sensitive emulsion into this tray. Tilt the tray gently so that the whole of the bottom surface is coated or covered, drain the excess of emulsion back into the stock bottle from one of the lipped corners and suspend it to dry. When dry, the paper is given a second coating of emulsion and drained from the opposite corner. This coating operation must be performed as quickly and as smoothly as possible. After the second coating is dry, the paper may be removed from its cardboard base, cut to a clean size, and kept folded, face to face, under pressure in a printing-frame, away from all light, until required for use. It is not advised to prepare more paper at one time than is to be used, since freshly sensitized paper works best. The drying of the paper after coating with the emulsion will not take longer than about ten minutes.

Making the Prints

There is no difficulty in making prints with this paper from the small negatives, the work being exactly similar to the making of any vignetted portrait upon print-out paper. Print a little deeper than is desired in the finished picture. Now cut the miniature print to a miniature oval, but with a tailpiece attached to it, so that it can be handled with a pair of tweezers.

Toning and Fixing

As soon as the print is finished, it should be washed for several minutes in cold water, then toned in a gold toning-bath made up as follows: Water, 15 fluid ozs.; saturated solution of borax, 2 fluid ozs.; chloride of gold, 2 grains. Four ounces of this solution will answer our purpose if the toning is done in a clean 4 x 5 tray. Watch the color of the print in the toning-bath and, as soon as it reaches a light purple brown, the print is done. It is then washed in running water for a few minutes and fixed in a bath made up of water, 10 fluid ozs.; hyposulphite of soda, 1 oz. Ten minutes' immersion of the prints in this solution will fix the pictures, which should then be thoroughly washed in a 4 x 5 tray, covered with a 5 x 7 glass plate, so adjusted that the water can trickle in it at one end and out at the other end between the plate and the tray. This adjustment is necessary because the prints are so small, and might otherwise wash out of the tray and be lost.

Transferring the Print

If the watch-dial, which is supposed to be separated from the watch as directed, has a name or sign printed upon the dial beneath the figure 12, this should be carefully removed by the following method: Procure 1 ounce of the strongest hydrofluoric acid. This, in the gutta-percha bottle required to hold it, will cost about 35 cents, the cost of the acid alone being about 5 cents. Now take a narrow strip of gutta-percha, or a match-stick with the end slightly softened, dip it into the acid and apply it carefully to the spot on the dial where the name is to be removed. Make a light stroke and have a tuft of wet absorbent cotton on hand, then, in two or three seconds after the application of the acid, wipe the spot on the dial with the wet cotton. This will remove the printing; if not, a second application must be made. It either case, the application of the acid and its removal must be done quickly, or the enameled face of the dial will be injured.

Having removed any letters on the watch-dial, or having a dial which does not require this, place the dial in warm water, cut the tailpiece away from the miniature print and place the print in a tray of moderately

hot water. In about half a minute or so, the collodion film bearing the image will be loosened. Now place the dial in water beneath the print. Flow the print into position upon the dial, and then, with a small wetted camel's hair brush, gently slide the film off its paper support, brush the paper aside, and adjust the little piece of film with its picture image exactly in the position desired. Stand the dial on edge, to dry, where no dust can reach it. There is no need for the use of any substratum in this method, as there is enough of the gelatine sugar compound in the film to hold it fast to the dial. When thoroughly dry, the dial should finally be coated with amyl acetate collodion, as already described, after which the picture is finished.

Photographs Upon Spoons The method of transferring photographs to spoons differs little, if at all, from the method given of transferring photographs to watch-caps and the like. The bowl of the spoon is generally matted, since this aids in giving a tooth or grain to the metal, to aid in holding the print. The print is usually made on carbon tissue, which is cut to the shape of the bowl of the spoon by means of a thin cardboard shape, which has first been fitted to the spoon. The purple or lambertype is generally used for this work, tissue of this color producing pleasing pictures.

The bowl of the spoon is coated with the gelatine substratum given for the watch-cap method, then dried and coated with plain collodion, after which the exposed tissue is wetted and placed, face down, in the bowl. See that it is gently pressed into contact at every point with the thumb. The development of the carbon picture needs no special instruction here. When the print is completed and dried, a coating of amyl acetate collodion is applied, as in the other processes.

Never use chrome alum to harden these delicate pictures upon metal. If used, it is only a question of time when the picture will crack and come away from the spoon or metal.

Photographs Upon Coins For some special occasions, such as a silver wedding or for the making of brooches, the photographer is asked whether he can produce pictures upon silver coins. A

half-dollar is most commonly used for this purpose. Where such pictures are needed, a few new coins are taken to a silversmith and the back of the coin is ground off and polished, the head of Miss Liberty (in the case of the half-dollar) being left upon the reverse side of the coin with the date. The polished backs of the coins are now matted, slightly treated with the gelatine substratum, dried and collodionized, just as in transferring prints to watch-caps.

The negative of the picture, usually a group of two heads or two oval portraits side by side, within a circle, is now placed on a retouching desk, and a wreath or decorative design painted on the film in black, so as nearly to encircle the two pictures. This forms a neater finish than a plain line circle. Such a negative is, of course, made by reduction in the camera, the portraits being brought within a circle less in diameter than the coin to which the completed picture is to be transferred.

The prints for these pictures are usually made with engraving black tissue or transparency black. Be careful to mark the back of the tissue at the top of the head of each portrait with the letter T, so that the top of the print will be the top of the head upon the coins when the print is transferred.

After printing, the transfer of the pictures to the coins is carried through in just the same way as was described for the making of photographs on watch-caps and dials, and finished with a coating of amyl acetate lacquer.

Note Re-matting-Metals In most of these processes, the matting of the metal surface is best done by means of the air- and sand-blast already described, in preference to the substitute matting. Care is needed, in the use of this sand-blast, not to use sand that is very coarse, the grain of the matting depending upon the size of the sand particles. By washing the sand through a very fine-meshed sieve, it can be graded to suit the purpose.

Intensification If any of the miniature negatives employed in the process given should require intensification, the following intensifier may be relied upon to give absolute satis-

faction: Prepare Solution *A*: Hot distilled water, 16 fluid ozs.; bichloride of mercury, 80 grains; potassium bromide, 80 grains. This preparation must be allowed to get quite cold before use. Solution *B*: Take 12 ozs. of a saturated solution of sodium sulphite and add to it 20 grains of citric acid, dissolve in 1 ounce of water. The negative to be intensified is placed in solution *A* until it is bleached right through, then well washed and placed in the acid sulphite solution *B*, until it is thoroughly blackened through, after which it is well washed and dried.

IMITATION ENAMELS ON CHINA AND METALS

Twenty years ago, photographic enamels, or ceramic pictures from photographic negatives, transferred to and burnt in upon plates and chinaware of all descriptions, in place of the usual hand-painted or gilt decoration, were in great favor. Apart from the use of the process for the decoration of tableware, it was widely employed for the decoration of special plates or china plaques for wall decoration, and for the production of ceramic tiles for bathrooms, mantels, and the like. Thus, the portrait of a beautiful girl or child, enameled in warm brown or Bartolozzi red upon a porcelain plaque, or an attractive marine or aquatic subject printed on tile in sea-green or blue, were specialties for which photographers could readily obtain good prices. These were true, vitrified enamels, and their production called for unusual care and skill, apart from a certain amount of uncertainty as to the final result, regardless of the care exercised in the work. Reliable methods and formulas were held as valuable trade secrets. The Robinson & Cherrill process was, if I remember rightly, offered to American photographers at $5,000. Because of the difficulty of obtaining reliable formulas, and the peculiar difficulties and uncertainty attending the working of the process, the ceramic or enamel photograph fell from favor, and is rarely seen today.

The Pseudo-Enamel

The process here to be described is a modification of the familiar carbon printing process, by which a clever and durable imitation or pseudo-enamel photograph may be obtained on china or metal. This, of course, is not a vitrified and, therefore, not an imperishable enamel picture. But, if carefully made according to the method here given, the pseudo-enamel photograph will have a permanency and durability almost equal to the decoration of the average piece of chinaware, and will retain its beauty for many years, with reasonable wear and care in washing. The process calls for careful manipulation, but anyone accustomed to the working of the carbon process will find no difficulties worth mentioning. Those who are equipped for carbon printing will, naturally, already possess most of the conveniences called for in the working of the method. Those who have yet to make a first beginning in carbon printing will need the following tools and material, which are simply those needed for the production of carbon prints of any description.

Apparatus and Materials

An 11 x 14 enameled-iron tray; two 10 x 12 hard-rubber or composition trays; a 6-inch flat rubber squeegee; an 11 x 14 papier-maché tray; one pound c.p. potassium bichromate; half-pound ammonium carbonate; half-pound of glycerine; half-pint of plain collodion; one ounce salicylic acid; four ounces amyl acetate; half-pound of carbolic acid; one pint amyl acetate collodion; one pound Heinrich's hard gelatine; one pound powdered alum; two dozen wooden clips; one 2-ounce, one 8-ounce, and one 16-ounce graduate; one glass funnel of 6 inches diameter; half-pound of absorbent cotton; two sheets of flexible support, and one cake of waxing compound (as supplied for the carbon process); one pint of spirits of turpentine; half a yard of canton flannel and a supply of carbon tissue. This latter may be of any desired color, those generally used being: Portrait brown, standard brown, engraving black, Bartolozzi red, or brown sepia for all portraits, and green, blue, etc., for outdoor subjects. The purpose and individual taste of the worker will guide him here.

The Sensitizing Solution

Presuming the requisite negatives and a supply of plates or china plaques to be at hand, the working of the method is as follows: First, prepare the bichromate sensitizing solution. Water, 48 fluid ozs; to this add 15 grains salicylic acid dissolved in 2 ozs. hot water; now add 2 drams glycerine. Crush 1½ ozs. bichromate potassium and 30 grains ammonium carbonate, and add these to the solution with vigorous shaking until complete solution of the ingredients is secured Finally, filter the solution through a tuft of absorbent cotton into a wide-mouthed amber or orange-glass bottle, and it is ready for use.

Gelatine Substratum

The gelatine substratum is prepared as follows: In an 8-ounce wide-mouthed bottle place 6 fluid ounces of water and 180 grains of hard gelatine; allow the gelatine to soak for half an hour, then place the bottle in warm water and continue the heating of the mixture, with occasional stirring, until complete solution is obtained. Now add 1 dram of a 10 per cent solution of carbolic acid, and filter the solution through a double thickness of cheesecloth or muslin, previously wetted and wrung dry.

Cleaning the Plates

To prepare the plates, plaques, or tiles to receive the substratum, they should be washed in hot soda-water (¼ pound of common washing soda in 1 quart of water). This is applied with a washing-mop, to thoroughly rid the surface of the plate of any greasy or organic matter which may be judged by the surface holding the water without any repulsion or creeping caused by the presence of grease. When washed in this way, the plates may be rinsed under the tap and placed in a tray of clean water, ready for coating with the substratum.

Coating the Plates with Substratum

Take one of the plates, drain off the surplus water, and pour upon the center a pool of the hot gelatine substratum solution. Tilt the plate until its surface is wholly and evenly coated, and drain the excess of substratum off into the bottle. Place each plate, as coated in this way, on a level table or shelf, away from dust, to dry. When thoroughly dry, fill

each plate with a formalin solution, made by mixing 1 ounce of formaldehyde with 16 ounces of water; allow this to remain in each plate for five minutes, then drain off the excess solution into a bottle for future use, and set the plate on its edge to dry, away from dust. This will render the gelatine substratum coating completely insoluble, and plates so prepared will keep any length of time, ready for sensitizing, etc.

Sensitizing the Tissue

Cut the carbon tissue to the size required for the plates in use, say 5 x 7 or 8 x 10, or buy tissue already cut to the size needed. Procure a sheet of glass 11 x 14 (a cleaned-off gelatine negative will serve). Pour a sufficient quantity of the bichromate sensitizing solution into an 8 x 10 or 10 x 12 tray; place rubber finger-tips on the fingers, to protect them from the bichromate solution and slide the tissue, face up, beneath the surface of the solution. See that no air-bubbles form upon the face of the tissue during the sensitizing, and then turn the tissue over, face down. When it lies perfectly limp and flat in the solution, the sensitizing will be complete. Place a sheet of waste paper upon a nearby table; on this place the 11 x 14 sheet of clean glass already mentioned; remove the tissue from the sensitizing bath, and place it, face down, upon the sheet of glass. Now place a piece of rubber sheeting down upon the back of the tissue, and apply the flat rubber squeegee in all directions from the center of the tissue with fair pressure, to press out the excess of sensitizing solution held by the tissue. Remove the rubber sheet; fix two wooden clips to the upper corners of the tissue, and clip two thin strips of wood about three-eighths of an inch wide to the other end; lift the tissue from the glass, and suspend it in a closet or dry, warm place, to dry away from all white light. The drying of the tissue can be aided by wiping the back with a piece of clean dry rag, after squeegeeing and before fixing the clips. It is important that the sensitized tissue should be dried as quickly as is possible, i. e., within four hours as a limit. When dry, it should be placed under pressure in a printing-frame until needed for use, carefully protected from air, light and dust. So

protected, sensitized tissue will keep in good working condition for a couple of weeks. It is advisable, however, to use the tissue as soon after sensitizing as possible, as it works better when freshly prepared.

Masking the Negative

The negative should now be prepared for printing. If it is to be printed as a vignette, or within an oval or circular form, the vignetting or masking for this purpose should be done and proved with a piece of print-out paper, to ensure the correct adjustment of the portrait before making the carbon print.

Preparing Flexible Support

Since the carbon process, used with an ordinary negative, gives a reversed print, i. e. a print in which objects which were on the right-hand side, in the subject will appear to be on the left-hand side, we must prepare what is known as the flexible or temporary support, on which the carbon picture is first developed and then transferred to the plate or final support, by which double transfer things will appear in their natural positions in the print, as in the subject. To prepare the flexible support for use, first dissolve half an ounce of the waxing compound already mentioned in 12½ ozs. of spirits of turpentine, made warm by standing the bottle in warm water, and shaking the mixture occasionally, to facilitate solution. Or, in place of the commercial waxing solution, we may use 3 drams of clear resin and 1 dram of beeswax in the same amount of turpentine.

Having such a waxing solution ready, take a piece of the flexible support of the same size as the print required, lay it down on a table or board, face up; fold a piece of canton flannel to form a pad of convenient size; moisten this with waxing solution by tilting the nose of the bottle against the pad held in the hand, and rub this well over the surface of the flexible support. Let this stand for two or three minutes, then take another pad of flannel and lightly rub the face of the temporary support at every part until the surface just seems to bite or cling to the pad, which indicates the time to stop rubbing. This preparation of the temporary or flexible support should be done a

few hours before needed for use. It is to be placed in a tray of cold water for an hour, or until it lies perfectly limp and flat just before use.

Printing the Picture

Everything being now ready for the printing of the carbon picture, the tissue is cut to the required size for the print in hand, and adjusted to the negative in a printing-frame in the usual way. All operations after sensitizing are, of course, done under yellow light. A second printing-frame, carrying a negative of similar quality to that being printed in carbon, and a piece of solio or other print-out paper, is made ready, and the two printing-frames put out together in daylight, to make the prints. After, say ten minutes' exposure in a good light, withdraw both frames and examine the progress of the printing of the print-out or guide print. The carbon print must not be examined. If the print-out paper shows a print in depth of tone about one-third that desired in a finished print, it may be taken that the carbon tissue is sufficiently printed; as carbon tissue sensitized as already described is three times quicker than print-out paper.

Transfer to Support

To transfer the tissue to the temporary or flexible support, the exposed tissue is removed from the printing-frame in yellow light, and placed, face up, in a tray of cold water. The fingers are now passed over the surface of the tissue, to dispel any air-bubbles which may have formed thereon. As soon as the piece of tissue is seen to lie limp and flat in the water, it is laid, face down, upon a piece of the wet flexible support (which should be ready for use in a second tray of water near at hand, as described in an earlier paragraph), and the two pieces, tissue and flexible support adhering face to face, withdrawn together from the water, drained slightly, and placed on a sheet of glass, with the back of the support down and the back of the tissue uppermost. Cover them with a piece of rubber sheeting and apply the flat rubber squeegee, holding the rubber sheet firmly at one end, to prevent its slipping, so that the tissue and its support will be gently forced into perfect contact. This is done by light strokes of the

squeegee, working smoothly and evenly from the center of the protecting sheet to its edges, until the excess of water carried by the tissue and support is expelled and they are everywhere in perfect contact. After this operation, let the tissue and the support stand undisturbed for half an hour.

Developing the Print

For the development of the print, we bring the 11 x 14 enameled iron tray into use. Fill the tray half-full with warm water, immerse the tissue and its support, then withdraw them together and again immerse them, thus getting rid of surface air-bubbles. Now increase the temperature of the water by adding hot water from a kettle or other supply at hand, introducing this at one end of the tray, not by pouring it on the print. Rock the tray so that the hot water travels from end to end, and in a few minutes the color or pigment of the tissue will be seen to ooze from the edges of the print. Now, very gently, hold the flexible support down to the bottom of the tray with the tip of a finger, and carefully remove the tissue from its support by gradually pulling it back over (under water) until it is completely released from the support. The paper backing of the tissue thus withdrawn from the support is put aside, and the flexible support, bearing the picture image in a mass of loose color pigment, is carefully floated onto a piece of glass for more convenient handling, and moved to and fro under the warm water, when the color pigment will gradually wash away, leaving the picture image, with all its details, visible on the support. This development of the picture image may be aided by gently laving warm water over the face of the print. Normally development will occupy about five or ten minutes.

When sufficiently developed, the print is removed from the developing tray, supported by the sheet of glass, and rinsed in cold water. It is then immersed in a 3 per cent solution of common alum for five minutes, washed in several changes of cold water, and suspended to dry away from all dust. Dirt and dust are fruitful sources of specks in the little prints, hence these evils must be guarded against.

Transferring the Print to the Plate

When the print upon its support has become thoroughly dry, it may be transferred to the plate or plaque as follows: The print is first immersed in cold water for half an hour, to make it thoroughly pliable. This done the plate or plaque, with its coating of hardened substratum prepared beforehand, as described on an earlier page, is washed in several changes of water to rid the film of the embedded formalin, and placed in warm water for a few moments. It is then placed in a tray of cold water, and the carbon print laid, face down, on the center of the plate. Now drain off the water, cover the print with a piece of thin rubber sheeting and, using a small squeegee or the twisted end of a towel, rub the print into perfect contact with the plate at every part of the picture image. Set the plate aside to dry. When thoroughly dry, the flexible support may be stripped away from the picture image underneath, leaving the picture in perfect contact with the plate in every part.

Shiny Spots

If any shiny spots are seen upon the face of the picture, caused by lack of complete contact between the image and the flexible support at the first transfer, the plate should be flooded with a warm solution of gelatine (5 grains of gelatine to each ounce of water), when the spots will disappear.

Lacquering and Stoving

When dry, the plate is now ready for lacquering. This is done by pouring a small quantity of amyl acetate collodion into the plate, letting it spread quickly over the whole surface, and then draining the excess off into the stock-bottle by pouring it through a small glass bottle. As soon as this coating is thoroughly set and dry, a second coating should be given in the same way, but the plate should be drained from the opposite side, to secure a more even coating. After the first coating, the excess of collodion should be wiped from the edges of the plate with a soft rag, and, when the plate has become dry after the second coating, the surrounding edges of the plate should be wiped clean with a soft rag dipped in amyl acetate (not

the collodion). When so coated twice and well cleaned, the plate may be submitted to heat at a temperature of 300° Fahr. in a gas oven, and kept at that temperature for ten or fifteen minutes, after which time it should be allowed to cool very slowly. This "stoving," as it is called, gives great hardness or durability to the picture, so that the plate may be carefully washed or subjected to a reasonable amount of wear and tear without fear of injuring the picture.

This process can be much simplified by using the single transfer method, in which the carbon image is transferred direct to and developed on the plate itself. With ordinary negatives this gives pictures reversed in position, but with most portrait subjects this is not of great importance. Where it is important, a reversed negative is essential.

If the single transfer method is employed, the formalin hardened substratum must be well washed to get rid of the retained formalin in the film, which would tend to make the carbon print insoluble. This done and the plate dried, it is coated with plain collodion which has been slightly thinned down by the addition of a mixture of equal parts of alcohol and sulphuric ether. After this coating, the plate is immersed in cold water and left there until all traces of greasiness have disappeared, which indicates the washing out of the alcohol and ether.

The exposed carbon tissue, cut to size, is placed in cold water until limp, and there placed in position, face down, upon the plate, and pressed into close contact as already described. After ten minutes contact under slight pressure, development may begin in warm water, as described in the double transfer process. When the image is completely developed, rinse the plate in cold water, place it in the alum solution, wash and dry as before. If any spotting is required, or if it is desired to color the picture (with ordinary water colors), this should be done now, before the lacquering process is begun. The amyl acetate collodion does not cause the colors to run, and enamels colored in this way are remarkably effective. Lacquering and stoving complete the making of the pseudo-enamel.

Very beautiful prints on metal are easily produced by a slight modification of this process, and such prints, because of their beauty and durability, find a ready sale. Apart from portraiture, the choice of the subject and of the color of the carbon image has much to do with their effectiveness. A pseudo-moonlit landscape or marine view, in dark blue tissue on an aluminum plate is naturally more effective than the same subject in brown on a copper plate. For many portrait subjects, purple-brown tissue on a silvered copper plate (an old daguerreotype plate) is a good combination. Whether the plates used are highly polished or matted is a detail for personal preference.

In practice, the plates are first thoroughly cleaned in a warm solution made up by dissolving 1 ounce of ammonium carbonate (or 1 ounce of sodium carbonate) in a pint of water. Use a mop or tuft of absorbent cotton for this washing, to avoid scratching the surface of the plate. As soon as the water clings to the plate, rinse under the tap and coat it with hot gelatine substratum prepared as follows: Dissolve, with heat as usual, 100 grains of hand gelatine in four fluid ozs. of water; then add 15 grains of chrome alum previously dissolved in 1 oz. of hot water. Add the chrome alum solution a few drops at a time, with constant stirring, or the gelatine solution will coagulate and be useless. Finally, add 1 dram of a 10 per cent solution of carbolic acid, and strain the mixture through cheese-cloth when it is ready for use.

When coated with this substratum, the plate is placed in a clean rack to dry away from dust. The exposed carbon tissue being made ready for transfer and development, one of the substratum coated plates is first coated with plain collodion and placed, face up, in a tray of clean water. The tissue, made limp and flat by immersion in water as usual, is placed face down on the wet, collodionized plate, squeegeed into perfect contact and, after ten minutes contact, the carbon picture developed, rinsed, alumed and washed, just as described for the development of single transfer prints on plates. When thoroughly dry, the plate is finally coated with amyl acetate collodion, drained and dried

away from dust, thus acquiring a hard, colorless lacquer which perfectly protects the picture. Celluloid varnish, sometimes recommended for the protection of carbon prints, should never be used for these prints on metal. It is not the same as amyl acetate collodion, gives a much more delicate film, and, when moistened or wetted, will easily wipe off the plate, bringing the picture with it.

MINUTE OR MICROGRAPHIC PHOTOGRAPHS FOR NOVELTY SPECIALTIES

Doubtless the reader, on his trips abroad, has examined with interest the little ivory or ivorine specialties or "charms," such as paper-knives, miniature opera-glasses, pen-handles, etc., which have as part of their decoration a tiny lens, about the size of a pea, on looking through which one sees a photographic picture of a building or scene of local interest. If this minute lens is removed from the "charm" in which it is embedded, it is seen to be a cylinder of flint glass forming, in fact, a long plano-convex lens, whose focus is at its own plane surface, with a minute photographic transparency mounted at the other end. On viewing this little picture through the lens, it is seen to be magnified, so that its details may be observed with as much comfort as we look at an ordinary pocket-camera picture.

The production of the minute photographs for this purpose calls for a great deal of patience and skill, but their manufacture in large quantities forms a profitable, though small, photographic industry, carried on chiefly in France and Switzerland. Incidentally, I may mention that these micro-photographs (as they are properly called, to distinguish them from photo-micrographs, which are enlarged photographs of microscopic objects) were utilized to practical advantage by the French during the Franco-Prussian War of 1870, for the sending of dispatches or war plans over the enemy's lines during

the siege of Paris. At that time, the micro-photographic copies of the documents or plans to be sent were printed on thin paper, wrapped about the leg of a pigeon, and despatched by "pigeon post." Today this sort of work, including photographing en route above the enemy's lines, is done by the military photographer from an aëroplane, to better advantage.

The following method is perhaps the simplest of any thus far published for the production of these micro-photographs, or bird's-eye view novelties, as they are often called in the shops where sold.

How Made The picture image of the bird's-eye view is, as has been said, a miniature transparency or positive picture; a great many such transparencies being printed at one time upon a thin, tough, and almost structureless collodion film, coated on a strip of thin glass, such as is used in microscopical work. Sometimes these transparencies are printed on a specially prepared print-out emulsion, coated on a base of transfer paper, from which the film bearing the picture is later stripped and mounted on the little magnifying lenses, after which they are ready for use.

Structureless Film It is essential that the collodion film, used alike for the making of the negatives from which the transparencies are to be printed, as well as in making the transparencies themselves, shall be almost structureless or without any grain; since this, when enlarged by the magnifying lens, would seriously interfere with one's pleasure in viewing the fine details of the picture. The ordinary gelatine dry plate cannot be used for this purpose, because the grain of the silver forming the image, as deposited in development, is so coarse that, magnified to about three hundred diameters, it presents the appearance of coarse gravel. Similarly, a collodion negative developed with protosulphate of iron, although much finer in its deposit than any gelatine negative, will present the appearance of coarse sand when magnified to the same degree. Hence, in the method to be described, the sensitive film is a collodion-albumen film, such as was formerly employed in the making of

fine lantern-slides of scientific subjects. The developer, too, is one calculated to give the finest possible deposit, free from grain.

From all this it is obvious that, in working the collodio-albumen method for the purpose here in hand, the trays, bottles and other vessels employed must be kept scrupulously clean, and that cleanliness and extreme care to guard against dirt and dust must prevail throughout all the operations.

Collodio-Albumen Process

For this process, a supply of bromo-iodized collodion must first be prepared ready for after use. The basic plain collodion is made as follows: Take sulphuric ether, sp. gr. .720, 10 fluid ozs.; pyroxylin (negative cotton), 90 grains; shake the mixture well until the cotton is dissolved. Now prepare the iodizing solution as follows: Take alcohol sp. gr. .795, 5 fluid ozs.; cadmium iodide, 20 grains; ammonium iodide, 20 grains; cadmium bromide, 10 grains; and ammonium bromide, 12 grains. Shake the mixture until complete solution is obtained. Add this Iodizing Solution to the Plain Collodion prepared as above, shake the mixture well, and stand the bottle aside (well corked) for a full day before use. After this, the contents of the bottle should be carefully filtered, through a plug of clean absorbent cotton loosely pressed into the neck of a glass filter, into a clean bottle of convenient size, the top of the filter being covered with a glass plate to prevent the evaporation of the ether during this operation. When filtered, the Iodized Collodion is ready for use.

Preparing the Plates

The next step is to prepare the glass plates for making the negatives and transparencies. Whatever size of plate is to be employed, the plates must first be thoroughly cleansed by washing them in a hot solution of washing soda (one half pound of soda to a gallon of water), after which they are rinsed in running water, and placed in a tray of filtered water, from which they are removed one at a time, and, while still wet, coated with albumen solution prepared as follows: The albumen of one egg is well beaten with a silver-plated fork, so as to break it up, and mixed with 30 ounces of distilled water, to

which is added 1 dram of strong ammonia water. This albumen mixture is filtered twice, and several ounces poured into a glass graduate for use. The plates are then coated one by one, the surplus albumen solution being returned to the graduate, and each plate, as coated, placed in a clean rack to dry, away from dust. The plates may be stood upon clean blotting-paper to dry if a rack is not at hand. When the plates are thoroughly dry, they may be stored in a dustproof groove-box until needed for sensitizing.

Iodized Albumen Solution

Now make up the following Iodized Albumen Solution: Distilled water, 2½ fluid ozs.; albumen from fresh eggs, 10 fluid ozs.; potassium iodide, 50 grains; ammonium bromide, 10 grains; strong ammonia water, 2 drams. First dissolve the iodide and bromide in the water, add this to the albumen, beat the mixture into a froth with a silver or plated fork. Let this settle for twelve hours, then filter into a wide-mouthed bottle, ready for use.

The First Sensitizer

Now prepare the following Sensitizing Bath: Distilled water, 24 fluid ozs.; nitrate of silver (re-crystallized), 2 ozs.; glacial acetic acid, 1 fluid oz.; potassium iodide, 4 grains. Prepare this with care and secure complete solution, then filter into an amber or orange glass wide-mouthed bottle. This sensitizer, in practice, must be used in a glass dipping-bath, the plates being inserted and withdrawn vertically by means of an ebonite dipper. Both of these articles may be purchased from any dealer in photographic materials.

Collodionizing the Plate

To prepare the collodion for coating the plates, take of the bromo-iodized collodion, prepared as already described, 4 ozs., make a mixture of sulphuric either, 4 ozs., and pure photographic alcohol, 2 ozs. Of this mixture take 2 ozs. and add it to the 4 ozs. of the bromo-iodized collodion mentioned above, turn the bottle over a few times, to secure a complete mixture. To coat the plate, hold it by the lower left-hand corner with its dried albumen surface up, pour a pool of collodion upon the center, gauging a sufficient quantity to just thoroughly cover the plate, tilt the plate slightly so that the

collodion pool flows first to the right-hand top corner of the plate, then to the left-hand top corner, then to the lower left corner, and drain the excess of collodion back into the bottle from the lower right-hand corner, gently rocking the plate while it is draining. This will give an even coating. Now gently wave the plate in the air, to aid the evaporation of the ether.

The First Sensitizing

Now place the plate in an ebonite dipper and lower it vertically into the nitrate of silver bath, where it should remain about three minutes. All these operations must, of course, be done in an orange- or yellow-lighted room, away from white light. After three minutes' immersion remove the plate from the silver bath, drain it from one corner, so that the drippings fall back into the bath, wash the plate well under the faucet in a soft stream of water, and lay it in a tray of clean water in which three grains of potassium iodide have been dissolved in each ounce of water. One minute in this bath will suffice. Rinse the plate again under the faucet, wash finally in distilled water for a few minutes, drain well and, while still wet, pour upon the surface of the plate the Iodized Albumen Solution already prepared as described. Rock the plate after this coating, drain the excess back into the bottle and coat the plate once more, this time draining it from the opposite end. Now place it in a clean rack to dry in a warm room or drying-closet. Plates thus prepared will keep for a considerable time previous to the second sensitizing, if protected from white light.

The Second Sensitizing

The silver bath for the second sensitizing should be prepared in advance, and used in a separate vessel or dipping bath, i. e., not in the bath used for the previous collodion sensitizer. This bath is made up as follows: Distilled water, 20 fluid ozs.; nitrate of silver (re-crystallized), 600 grains; glacial acetic acid, 1¼ fluid ozs. The plates should be quite dry before placing them in this bath. One minute's immersion will suffice for the time of sensitizing, after which the plate is removed, drained, and washed well under the faucet, finally washed for a few moments in distilled water, and dried in a warm

room or closet away from dust, and, of course, white light. The plates are now ready for use.

Not Tedious in Use This process, as described, may seem to be a lengthy and tedious business. It is not so, however, when all the solutions are made ready, and the results cannot be equaled by any other method known. It is, of course, as useful for the making of fine lantern-slides of scientific subjects as for the purpose here in hand. This is worth remembering.

Negatives may be made upon these plates from any object or subject, as will be described a little later. The exposure may run into minutes, but where copies are made from good photographs, this does not matter. With a repeating camera, 18 different exposures may be made upon a 5 x 7 plate, each picture being made within the space of 1 x 1¼ inches. From this negative the still smaller reduced negatives may be made for producing the bird's eye or micrographic photographs required. After exposure, the plates are developed with the following developer.

The Developer For this a plain nitrate of silver solution is used. For example: Distilled water, 4 fluid ozs.; pyrogallic acid, 8 grains. The plate after exposure is first well wetted, and the developer flowed over the plate in a clean porcelain tray. Development proceeds quickly. Examine and, as soon as the fine detail is out, pour the developer off the plate into a clean graduate and add to it three drops of Intensifying Solution, prepared beforehand as follows: Distilled water, 2 fluid ozs.; citric acid 20 grains; nitrate of silver (re-crystallized), 30 grains. Now pour the developer, reinforced by the intensifier, over the plate again, when the image will soon gain the desired strength.

Fixing When development is complete, wash the plate well and fix in a plain hypo solution made as follows: Fixing Bath. Water, 40 fluid ozs.; hyposulphite of soda, 6 ozs. Collodio-albumen plates are slow in fixing, as compared with the ordinary gelatine dry plate, but fixation will usually be complete in ten minutes. When fixed, wash

the plates well under the faucet, soak them for a few minutes in distilled water, and place in a clean rack to dry, away from dust.

The use of distilled water in all these operations for the final washing or bathing is essential to prevent any spots forming upon the negatives or positives by the deposit of organic matter in the film.

Having obtained, by this method, negatives of the size mentioned, the first stage of the process is complete, and the next operation is, by the reduction method in the camera, to produce the micrographic positives (transparencies) desired. Needless to say, this part of the process requires considerable care and skill.

Method of Working

Let us summarize the method of working. It will be best to begin with plates 4 x 5 as a very good size for practice, and to content ourselves with making upon this size plate nine negatives of the subjects chosen to be reproduced, measuring 1 x 1¼ inches, allowing a space all around each picture. This will permit the cutting out of each separate picture, when the minute transparencies are obtained, so that we can attach them to the miniature magnifying lens.

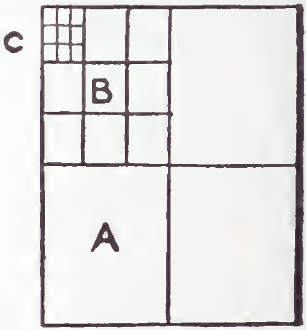

Fig. 3.

Setting up the originals (presumably good photographs) on a copying-board, we make the nine negatives on our 4 x 5 plate by the use of a repeating camera. Having secured a good negative of the nine originals on one plate in this way, we proceed to make a transparency from this plate by the process of reduction in the camera, using, of course, collodio-albumen plates all the way through. From these small transparencies we now make a negative, reducing the size of the picture still further, so that we get nine pictures within a space not larger than ½ x ⅝ of an inch. In the accompanying

diagram (Fig. 3), the original negative is shown at A, the size of the reduced negative at B, and C shows the micrographic transparencies made by the last reduction in the camera. Within each of these nine small spaces, not much larger than a pin's head, is the view which constitutes the micrographic picture sought.

Mounting the Positives

The little transparencies are now cut around with a diamond and attached with a touch of thin Canada balsam to the magnifying lenses, which completes the process.

Using Transfer Prints

As was said in the beginning, these micrographic transparencies may be produced upon a collodion stripping or transfer print-out paper. In the latter method, a miniature negative is first secured with the picture images of the size shown at C in the diagram, and prints made therefrom on the transfer print-out paper made specially for this purpose. It is a collodion-emulsion paper similar to that described on another page of this number, for making transfer prints on watch dials. Note, however, that for making micro-photographic prints, the quantity of soluble cotton per ounce of collodion in the emulsion should be increased by 3 grains. This gives a tougher film, enabling the small film transparencies to be handled more easily.

Perfect micrographic negatives for this printing by contact on transfer paper may be made from the little glass transparencies already spoken of. A large number of these may be combined upon one plate, so as to permit the printing of a great many upon one sheet of paper.

When mounting these extremely small photographs, whether with a glass or paper base, an eye-piece must be used, such as is employed by watch-makers. For the copying and reducing work, a short-focus, wide-angle lens is quite suitable, the anastigmat being preferable as giving perfect definition over the whole field.

The Focusing Difficulty

Some difficulty may be experienced in focusing to such a fine degree as is needed in these small negatives. This may be overcome as follows: When the first negatives are made, place near the top of each print or photo-

graph that is to be copied, a fairly large clean-cut black-printed letter, so that it will be reproduced with the three central negatives that form the group of nine upon the 4 x 5 plate. If properly focused, these letters will be reproduced perfectly clear and sharp upon the reduced negative, and they will form a guide for the focusing of the images in all the three reductions. The use of a strong focusing magnifier is, of course, indicated in this work. For the focusing screen, the use of a clean lantern-plate, prepared as follows, is advised: First coat the lantern-plate with rubber cement and, when just barely wet, dip the plate into water, allow it to soak, then drain, and while still moist, insert it in a kit of the plateholder for use. The screen obtained in this way gives the finest and most delicate focusing surface known. The opalescent coating will last not longer than half an hour, but this will be enough to secure a perfect focus of the printed letters mentioned, which ensures finely defined images in the tiny transparencies.

Buying the Small Lenses

The miniature magnifying lenses used for this class of work can be obtained from opticians who deal largely in lenses made abroad. Among such firms are Fussfeld-Lorsch & Co., 90 Maiden Lane, New York, and John Shiedig & Co., 34 Maiden Lane, New York.

The process, as here described, is by no means as difficult or as tedious in the doing as in the description. I have tried to make every detail plain by setting it out at length. With patience, care and cleanliness throughout, very little practical experience will give the worker the proficiency needed for the production of good work in this line.

PRINTS ON SILK, SATEEN AND OTHER FABRICS

Among the minor photographic processes concerning which amateurs and professionals are persistently curious, are the methods employed by commercial workers for making photographic prints on

fabrics. Such prints are used in making political, religious, or fraternal association banners, the decoration of cushion-tops and draperies, souvenirs to be sold at fairs, bazars, and for similar purposes. In a business way, these methods afford a profitable side line, of which the amateur with leisure can take advantage equally with the professional as far as local markets and opportunities are concerned.

The Methods

The methods and formulas given have been tried and proved in commercial practice, and can be relied upon to give satisfactory results if the working directions are carefully followed in each case. Many of the methods are now published for the first time. Those who take them up are warned that there is a necessary element of uncertainty in all methods of fabric printing, due to the variable nature of the different fabrics, and especially to the variations in the different "sizing" or "filling" employed to give this or that fabric "body" in preparing it for market. For this difficulty no remedy can be suggested except experimenting with the fabric in use, until its peculiarities are understood.

Materials

For direct contact prints on fabrics, usually in the smaller sizes, 4 x 5 to 11 x 14, silk is most largely used as giving the most pleasing qualities in the print. Satin, with a silk backing, is equally suitable where a heavier material than silk is needed, as in making processional banners. Of the lower-priced materials, and for general use, sateen of good quality, priced, say, at 25 cents per yard, is the most generally used fabric, possessing "body" and wearing qualities superior to silk for many purposes. The finer grades of cotton and linen are also available, and these, with sateen, are most generally employed for large prints or enlargements, where cost of production must be considered.

Working Conveniences

For the successful working of these methods, the chemicals used should be of the quality designated in the formulas, avoirdupois weights being used throughout in compounding. Glass or porcelain trays are advised, and should be kept scrupulously clean. Hard-rubber trays

may be used for fixing and some other purposes indicated. All trays should be an inch or two larger than the piece of fabric to be printed on. Besides these, the worker will need a few clean bottles, including some of deep yellow or orange glass for solutions which must be kept from the influence of actinic or white light; a light-proof drying closet or room; a few wooden photographic clips, paraffined or coated with shellac varnish, so as to be impervious to chemical contamination, and a few sheets of plate or thick glass and some World "Photo Finish" or other pure blotting paper.

Contact Prints on Silk or Sateen

There are two methods of preparing silk and sateen for contact printing direct from the negative in a printing-frame. In the first method, the fabric is first treated with a "salting" solution and then separately sensitized. In the second method, the salting and sensitizing are done at once. The latter method is perhaps best suited for sateen and, with this material, gives more brilliant prints than the former.

Salting Solution

A suitable salting solution for the first method is prepared as follows: Boiling water, 20 fluid ozs.; Iceland moss, 60 grains; ammonium chloride, 50 grains; sodium chloride (common salt) 50 grains. Stir this mixture well with a glass rod or silver-plated spoon, to facilitate solution. When the solution is almost cold, filter it through a plug of clean absorbent cotton, loosely placed in the neck of a glass funnel, into a clean bottle of suitable capacity.

Alternative Formula

An alternative salting solution is prepared as follows: Soak 100 grains cooking gelatine in 10 ounces of cold water for 20 minutes, or until the mass of gelatine is softened. Now gently heat the mixture, with constant stirring, until complete solution is reached. Add hot water, 10 fluid ounces; sodium chloride (common salt), 100 grains; magnesium lactate, 100 grains.

Salting the Fabric

Salting solutions should be almost, but not quite cold when used. To salt the fabric, immerse it thoroughly in a sufficient volume of salting solution, and let it remain

therein for ten to fifteen minutes. Drain off the surplus liquid and suspend the fabric to dry away from dust, using wooden clips—not metal pins. When dry, the fabric should be straightened or flattened on a piece of glass and kept under pressure in a printing-frame or portfolio, secure from dirt and dust, ready for sensitizing when needed.

Sensitizing Solution

The sensitizing solution for use with either of the above salting solutions (for silk and sateen) is made up as follows: Distilled water, 16 fluid ozs.; nitrate of silver (recrystallized), 2½ ozs.; citric acid (crystals) ½ oz. If thorough solution is obtained by continual stirring with a glass rod, filtering is not necessary.

Sensitizing the Silk

Pour a sufficient quantity of the acid silver solution into a clean glass or porcelain tray, a little larger than the piece of fabric to be sensitized. Take hold of the fabric at opposite diagonal corners (right hand top and left hand bottom corners) between the thumb and finger of each hand, and gently slide the fabric down upon the face of the sensitizing solution. Allow it to remain for 3 or 4 minutes, then lift by the two upper corners (with wooden clips), and let the surplus solution drain off into a glass funnel in the stock bottle. After this, the fabric is suspended by the wooden clips to dry in a dark room or drying closet away from white (or actinic) light. The sensitizing, of course, should be done in a darkroom, or any room well lighted with yellow light. This can be secured by loosely wrapping yellow paper around an electric light bulb, or pinning sheets of yellow paper over the window, if the work is done during the day. It is always advisable to do such work in the shadow of the body, thus shielding the sensitized material from direct light of any kind.

Toning Solution

After the prints have been printed, they will need to be toned; and, as all toning solutions work better when a few days old, the toning solution should be prepared beforehand, as follows: Water, 30 fluid ozs.; acetate of soda, 2 drams; bicarbonate of soda, 20 grains; chloride of gold, 4 grains. Dissolve in the order here given,

shake well to hasten solution, and let the solution stand, until needed, away from daylight.

Printing

When the silk is dry after sensitizing, it should be placed on a piece of thin cardboard, of such a size that the ends of the fabric may be folded over on the back of the card and there slightly attached by a strip of gummed paper. The negative to be printed from is now fitted in a printing frame, a vignette or other mask fixed to the front of the frame where, as in a small portrait, the whole of the negative is not to be used.

The piece of fabric attached to its card support is now placed, sensitized face down, on the film side of the negative, and the back of the printing-frame inserted and fastened as usual. Printing is done as usual, by exposure to daylight or an electric arc, the progress of printing being watched by occasionally opening one half of the frame, and carefully bending back the fabric on its support for an inspection of the face of the print. This inspection, with care, can be done without risking loss of registration.

The printing should, with silk, be carried a shade or two darker than is desired in the finished print, since there will be a slight reduction of strength of image in the subsequent manipulation. As soon as the print reaches the desired depth, remove it from the frame, detach the fabric from its support, and wash it in several changes of water until all traces of milkiness disappear from the wash water.

Toning the Print

To tone the fabric print, pour a sufficient volume of the toning solution, prepared as above, into a clean porcelain tray, which should be a few inches larger than the print to be toned. Immerse the print thoroughly, and examine it after two or three minutes' immersion. As soon as the tone or change of color is completed, drain the gold toning solution from the print by lightly wringing the fabric in the fingers, then wash in several changes of water.

The fixing is done by immersing the toned and washed print in a fixing bath made as follows: water, 20 fluid ounces; hyposulphite of soda, 4 ozs. The print

should remain in this bath from ten to fifteen minutes, according to the depth of the tone. It is then removed, well wrung out, and washed for half an hour in six or eight changes of water.

Drying and Finishing After washing, the print is wrung out fairly dry and carefully straightened or flattened on any plane, smooth surface, and ironed with a flat iron made not too hot. If this be properly managed, the print will dry smooth and brilliant in appearance, ready for any use one desires. Another method of drying fabric prints is to smooth them down upon a large ferrotype plate, by means of a soft rubber squeegee. When dry, the print is readily stripped from the plate.

The Second Method An alternative method for contact prints, suited to sateen, cotton and linen, as well as silk, calls for a combined iron and silver sensitizer. Make up the stock sensitizing solution as follows: A—Hot distilled water, 4 fluid ozs.; citric acid (cryst.), ½oz. B—Distilled water, 8 fluid ozs.; ammonia-citrate of iron (the green variety), 2 ozs.; C—Hot distilled water, 4 fluid ozs.; nitrate of silver (recrystallized), 1 oz. These three solutions should be mixed in clean bottles in the darkroom and well shaken to ensure complete solution. This assured, take a large yellow or amber glass bottle and pour in Solution A. To this add Solution B, with constant shaking, and then add Solution C. Make sure of complete mixture, allow the solution to get cold, then filter it through absorbent cotton, always using a glass funnel for such filtering. Stored in a yellow bottle, this sensitizer will keep in good working order for months.

Sensitizing The sensitizing is done in a room with yellow light, as before. Place a sheet of plate-glass, about 11 x 14, on a larger sheet of white blotting paper. Pour a sufficient quantity of the sensitizer into a clean glass or cup, which is placed in a saucer, to catch any drippings during the work. Having the sateen or fabric cut into pieces of convenient size for the work in hand, lay a piece, back down, on the glass, and fold the ends under the glass, if this is possible, thus keeping the fabric stretched and

flat. Now apply the sensitizer to the surface of the fabric with a flat camel's hair brush mounted in rubber (not metal), passing the brush lengthwise, and then crosswise, over the surface of the fabric. If only a small portion of the piece of fabric is to be printed on, as when a portrait is masked or vignetted on a piece of silk, then apply the sensitizer only to this portion. Do not mind the mark which will appear where the sensitizer dries, as this will disappear when the print is toned, fixed, and washed.

Drying and Storing

As soon as the sensitizer has been applied and the fabric evenly saturated, suspend the piece to dry in any warm closet or room away from white light. The excess of sensitizing solution not used may be poured back into the stock bottle for future use. When dry, the sensitized fabric may be stored in a printing-frame or between sheets of glass, of course away from all white light, ready for use when wanted. Sateen prepared with this formula will keep in good printing condition for two or three months—always well protected from white light, dust and air.

Printing

Sensitized sateen, as here described, is printed by direct contact with the negative, in the same way as indicated for silk, except that the sateen is placed face down on the negative in the printing-frame, with a piece of stiff paper at the back of the fabric. The printing-frame should be larger than the piece of fabric, so that, when it is half opened for the inspection of the print, the top half of the print will fall back with its paper backing, upon tilting the frame, so that the face of the print may be examined without touching or pulling the fabric with the hand at all. Carefully handled, this obviates all risk of stretching the print.

The printing, in this method, should not be carried so far as was advised for printing on salted silk; in fact, slight underprinting is advised, as the image develops to a certain extent in the after manipulation. This is especially so in the case of pink sateen. I have not observed it, to any noticeable extent, with light yellow or green sateen.

When printing is complete, wash as described in the preceding method, and tone as before. Do not, however, look for change of color in the toning operation. The effect of going through the toning bath is enough. Remove the print, wring out the surplus toning solution, wash in two or three changes of water, wringing the print out after each washing, and fix in: Water, 30 fluid ozs.; hyposulphite of soda, 2½ ozs. Note that this fixing bath is much weaker than that advised for salted-silk prints. Five minutes' immersion in this bath is sufficient, after which the print should be wrung out, washed in twelve changes of water, again wrung out and ironed, just as advised for finishing prints on silk. In this method, the hotter the flat iron, the darker will be the color of the print, while the use of a warm flat-iron gives rich brown prints. For sepia tones by this method, fix the print, without toning, after printing and washing. If these operations are carried through with reasonable care in each stage of the work, there need be no fear of the permanency of the pictures.

ENLARGEMENTS ON FABRICS

For the making of enlargements on sateen or other fabrics, we may use the ordinary enlarging apparatus, or print by direct contact from large paper negatives. Whichever method is employed, the greatest care must be used to ensure that, after the salting of the fabric, no actinic light whatever shall reach the fabric, as this will result in either a veiled picture image, or the blackening of the whole surface of the fabric. Note also that where acetic acid is mentioned in the formulas given, this means "glacial" acetic acid and not the ordinary, commercial variety, which is four times weaker than "glacial." We will need serum of milk for the salting solution and, as this must be prepared as needed, I will first give the method of preparing it.

Preparing Serum of Milk

Let two quarts of milk stand in a flat dish until the cream has separated, then carefully skim every trace of cream from the surface of the milk. Add to the skimmed

milk remaining, 1 ounce of glacial acetic acid. Stir well and boil the mixture for a couple of minutes. When cold, filter twice, using a fresh plug of absorbent cotton for each filtering, with a clean glass filter. The product so obtained is serum of milk.

Salting Solution

To prepare the salting solution, take: serum of milk, 10 fluid ozs.; potassium iodide, 100 grains; cadmium bromide, 25 grains; potassium bromide, 50 grains. Hasten solution by stirring the mixture with a glass rod, and filter through a plug of absorbent cotton that has first been thoroughly wetted with distilled water, and wrung out nearly dry. Use a glass funnel for the filtering.

An alternative salting solution is prepared exactly as above, but the cadmium bromide is omitted. Another is made up as follows: serum of milk, 10 fluid ozs.; cadmium iodide, 80 grains; cadmium bromide, 40 grains.

To salt the fabric, lay it, back down, on a sheet of glass, and apply the salting solution with a flat camel's hair brush set in rubber, or a cotton swab (made by tying two or three thicknesses of canton flannel over the end of a 4 x 5 plate); or the fabric may be immersed in the salting solution for ten minutes, then withdrawn, drained, and suspended to dry. Perhaps the immersion method is preferable, as more thorough. Fabrics so prepared will keep in good condition for sensitizing for weeks, if stored away from light and air, between two sheets of glass, or in a printing-frame or portfolio. See that no light reaches the fabric after salting. When dry, it is ready for sensitizing.

The Sensitizer

The sensitizing solution for enlarging is made as follows: Distilled water, 10 fluid ozs.; nitrate of silver (recrystallized) 560 grains; glacial acetic acid, 2 fluid ozs. Sensitizing, of course, must be done in yellow light or in a dark-room, and the sensitized fabric jealously guarded from white light.

To sensitize, place the salted fabric, back down, on a sheet of glass which rests on a sheet of blotting-paper. For convenience, the fabric may be folded back under the glass at each end, if its size permits this. A small quantity of the sensitizer is now applied to the surface

of the fabric, and spread evenly over the portion previously marked to be sensitized, by means of a cotton swab, made as already described, or a clean tuft of cotton tightly plugged in a glass tube of convenient width. Spread the sensitizer evenly over the surface by lengthwise and crosswise strokes, to get an even coating. Do not use an excess of solution. A few trials will enable the worker to determine the quantity of solution required to sensitize a given area of fabric, and the knack of spreading and coating a surface evenly will come with a little careful practice.

Exposure Immediately after the sensitizer has been applied, the fabric is attached to the exposure-board or easel of the enlarging outfit. It is presumed, of course, that the picture to be enlarged has already been carefully focused on this board and the lens capped with the yellow glass enlarging cap, so that there will be no delay between sensitizing and the exposure of the fabric. Now open the lens, by removing the lens cap, and expose until a faint image is seen upon the surface of the fabric. With an arc light, as usually employed in this work commercially, the exposure may be anything from 5 seconds to 5 minutes, this depending on the quality or density of the negative from which the enlargement is made.

As soon as all the details of the picture image are faintly visible on the fabric, remove it from the exposure-board and lay it, back down, in a developing tray of suitable size. The following developer is now poured over the enlargement.

Developer Distilled water, 32 fluid ozs.; pyrogallic acid, 90 grains; glacial acetic acid, 2½ fluid ozs.; saturated solution of citric acid, 10 drops. An alternative developing formula is: Distilled water, 20 fluid ozs.; gallic acid, 192 grains; acetate of lead, 96 grains; glacial acetic acid, 1½ fluid ozs.

The developer should be flowed over the exposed fabric in one sweep without stoppage. If the fabric is liable to crease or roll up under the motion of the developer, this may be prevented by stretching the fabric flat on a piece of glass, and folding the ends back

behind the glass, so that the pressure of the glass upon the ends of the fabric when laid in the tray will keep the exposed portion fairly flat and rigid.

As soon as the right depth of image has been secured in development, pour off the developer, wash the fabric well in running water, wring out the surplus wash water, and place the print in a combined toning and fixing bath made as follows:

Fixing Bath

Water, 80 fluid ozs.; hyposulphite of soda, 16 ozs. When the hyposulphite has thoroughly dissolved, add 5 grains of chloride of gold, previously dissolved in 2 ounces of water.

The time of fixing may be estimated by examining the fabric and observing when the yellow iodide of silver has disappeared. Allow the print to remain in the fixing solution fully five minutes after all trace of the yellow iodide has disappeared. Now wring out the print and wash it thoroughly in running water for an hour, with occasional wringing out, to thoroughly eliminate the fixing salts. When sufficiently washed, the print should be wrung out as dry as possible and ironed with a hot flat-iron, or it may be squeegeed upon a sheet of glass or ferrotype plate and allowed to dry thereon, after which it may be spotted and finished, or colored with pastel, according to taste.

Large Prints from Paper Negatives

It is obvious that enlarged prints of any size may be made upon sateen and other fabrics, by contact printing from an enlarged paper negative. The objection usually urged against the use of large paper negatives, viz: that the grain of the paper shows in the print, does not apply in this method, as any grain is completely lost in the weave of the fabric used to make the enlarged print.

Making the Negative

An enlarged paper negative is made by using a thin bromide paper. This is placed in the ordinary plateholder or darkslide between two sheets of glass, to keep it flat, the enlargement being obtained by the use of a large camera just as in copying. For example, if we desire an 11 x 14 enlarged paper negative from a 6½ x 8½

print, we shall need an 11 x 14 camera with a plate-holder.

Preparing the bromide paper for exposure as above directed. The picture to be enlarged is carefully focused on the ground-glass screen of the enlarging camera, the plateholder carrying the bromide paper placed in position, after which follow the exposure, development and fixing of the enlarged print. Of course, a small transparency may be used in place of the original 6½ x 8½ print, in making the enlargement, in which case the transparency should be backed with a piece of ground-glass and fixed against a window, after which the image is focused and the enlargement made as above described. Any retouching, working up, change or improvement desired in the picture may readily be done upon the paper negative with an ordinary pencil.

Making the Print

Having such a negative ready for use and desiring to make the print, we proceed as follows: A piece of sateen or other fabric is salted, sensitized and dried, as described in the iron and silver compound method already given. Assuming that the piece of sateen is 24 x 24 inches, and that the center portion only is to be sensitized for use with a paper negative, 11 x 14, take a piece of clean glass plate, 11 x 14, and pour upon the center a small pool of glycerine. Now lay the paper negative, back down, upon the glass plate and spread the glycerine out over the whole of the plate and back of the paper negative, by placing a piece of rubber sheeting upon the face of the print and apply a squeegee, working in all directions from the center to the edges of the plate. The glass plate should rest upon a sheet of blotting paper, so as to absorb any excess of glycerine which may be squeezed out by the squeegee.

The surface of the print may now be carefully wiped with a clean cloth, if this is necessary to remove any touches of glycerine, and the piece of dry sensitive fabric is laid, face down, upon the negative, so that the outer edges may be smoothly folded back over a piece of thin cardboard, 11 x 14, previously laid over the fabric as soon as this has been placed down upon the negative, which in turn rests upon the glass plate.

The paper negative on its glass support, with the fabric superimposed as just directed, is now carefully fitted in a printing-frame, the frame and its contents exposed to daylight, just as in contact printing, and the image printed, toned, fixed and washed, exactly as described in the iron and silver method given on an earlier page.

The results obtained in this method leave nothing to be desired if the various operations are carefully managed as described.

Using Other Fabrics

Cotton and linen fabrics, if used for any of the methods here described, should be first carefully washed in several changes of warm water, in order to get rid of the stiffening or "finishing" or "filling" employed by the manufacturers to give these fabrics "body." I have not found this preliminary treatment necessary with sateen of good quality, that costing about 26 cents per yard.

Caution

Separate trays should be used for the various salting and sensitizing solutions in all the methods where nitrate of silver is employed. The tray used for development, especially, must be kept for that purpose only, a hard-rubber or composition tray being best suited for the purpose. All trays should be well washed after use, cleanliness being essential to success in these methods.

Alfred J. Jarman.

Forest Patrolmen at Breakfast: Merced Big Trees, California
Edgar A. Cohen

Notes and Comment

It is with a keen sense of sorrowful loss that I record the death of Maurice G. Gennert, of the firm G. Gennert, New York City, which took place after a long illness, at the French hospital in this city, on Saturday, October 2. Mr. Gennert was born in Illinois forty-eight years ago, came to New York with his family as a boy of eight years, and graduated from Columbia University in 1887. He leaves a wife and two daughters who mourn his untimely death.

Many years of fairly close acquaintance with Mr. Gennert enable me to say that, by his death, American photography suffers a severe loss. Succeeding with his brothers, Gustave C. and Henry G., to the splendid business established by his father, Gustave Gennert, combining the importation, manufacture and trading in photographic apparatus and materials on a large scale, Mr. Maurice Gennert, fresh from college, took upon his young shoulders a burden and responsibilities which called for age and mature experience in the business world. His success as the head of the firm for these last twenty years was due to that strength of character, combined with business acumen and a charming personality, which endeared him to all with whom he came in contact. It is a thousand pities that he had to go so soon. May the earth rest lightly upon him.

The part played by the electric light in photography today is very much larger than most of us dream. In portraiture, in copying and enlarging, and in commercial and color work, not to speak of the reproduction processes, the electric light is very largely taking the place of daylight.

This advance is, in a special way, due to the perfection of the Cooper-Hewitt Light, which undoubtedly

surpasses every other form of artificial light in efficiency and convenience for photographic use.

The latest introduction of the Cooper-Hewitt Electric Co., Hoboken, N. J., is the new M-shaped enlarging lamp, which gives what is practically equal to a north window against a clear June sky, a studio light without a flicker or variation, which can be used without condensing lenses or other devices for securing equal diffusion of illumination, and especially a light which does not need constant attention and is always under perfect control.

The possibilities of this new lamp outfit for copying and enlarging are too many to be discussed here in detail, but those who are interested should send to the manufacturers, addressed as above, for Bulletin No. 2761, which describes and illustrates the outfit.

For a year or more the firm of Farron S. Betts has done a valuable work in persuading amateur and professional photographers to "Get the Album Habit." The line of photographic albums manufactured by this well-known house covers every requirement of the amateur, professional and commercial photographer. It is carried by most photographic dealers and is worth looking into, now that the winter months and long evenings are ahead. Meanwhile, I am asked to advise my readers that the New York office and salesrooms of the firm have been closed and are now consolidated with the factory at 220 Thirty-sixth Street, Brooklyn, N. Y., to which address all communications should hereafter be addressed.

Despite the plain fact that flashlight photography is for every month in the year and not especially for the winter season, the average amateur and professional persists in thinking that the flashlight season begins with the coming of winter. Be this as it may, the flashlight deserves to be more widely known and used, and for this I strongly recommend a careful reading of "Flashlight Photography" and the several other beauti-

fully illustrated booklets and leaflets published by James H. Smith & Sons Co., 3541 Cottage Grove Ave., Chicago. These can be had free for the asking if you mention this note. I would like to be sure that every reader of THE PHOTO-MINIATURE had a practical acquaintance with the valuable information these booklets will give him.

In the engraving accompanying this note, the world gets a glimpse at one of the most effective bits of photographic advertising within my knowledge. As everyone who has visited Detroit knows, this boat, bearing the

bold legend, "Kodaks, Blacks, 156 Woodward," is maintained on a perpetual cruise up and down the Detroit River. Not everyone knows, however, that the Detroit River bears a larger yearly volume of tonnage than many of the world's greatest ports. Because of this great passenger and tourist traffic, it is estimated that the advertisement here illustrated is seen by over ten millions of people summer after summer. This, I am confident, breaks the record in photographic advertising and reflects great credit on the L. Black Co., of Detroit, whose photographic department is under the direction of Mr. Herman W. Boers, one of the most

widely known and esteemed men in the photographic trade.

Since the wave of economy began to spread over this fair land at the beginning of the great war, I have had many requests for the name of a reliable house where amateurs could obtain bargains in the way of "slightly used but as good as new" photographic outfits. To such I can recommend the house of David Stern Co., 1047 P- West Madison St., Chicago, Ill.

This firm has been in business since 1885 on the basis of "Money back if you are not satisfied with your purchase after ten days' trial." Write for their list, which offers everything in the way of cameras and lens equipments that any mortal could desire.

A Clever Attempt at "Moonlight"
W. H. Wallace

Drear Autumn
W. H. Wallace

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT
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Remedies for Defective Negatives

They have made photography so simple that we are apt to forget the price which is paid for this attractive simplicity. Nevertheless a price is paid, and among very many workers the coin is a lowering of the standard of quality in the average result. It is all so easy and quick that it seems less worth while to take any trouble. We argue to ourselves that it is easier to make another negative of the subject than to fuss over the improvement of the first. There is some truth in this; but it is not always possible to get the second negative. And, apart from this, the spirit behind the self-indulgent excuse is one that does not tend to any reasonable mastery of photographic processes, and does tend to lessen the real pleasure there is in doing a thing as well as it can be done.

So, it all comes to this, that the great majority of amateurs have dozens or hundreds of negatives in their files, which have never yielded prints or enlargements simply because they were judged and dismissed as "not good enough." Among these discarded negatives the reader will find abundant material for profitable and pleasureable winter work, which will give him a new collection of negatives capable of producing anything he desires in the way of prints or enlargements. Better than this temporary gain, in practicing the methods which follow, the reader will learn just

how to deal with a negative as it comes wet from the wash-tank, and will thereby advance the standard of his work several notches above its present level.

Such of these methods as are of real practical value are the subject of the present monograph, which aims to supply an exact and sufficiently comprehensive working knowledge. I could multiply formulae *ad infinitum* but I should not be able to prescribe any which would do more or do it better than those here given. The old text-books—and five years ago is "old" in photography—had much to say of methods of intensification and reduction which the writers, good men though they were, were wont to recommend for over-exposed or under-exposed negatives, as the case might be, forgetful of the fact that many a tyro needed someone at his elbow to tell him in which class his poor negative came. Here we will endeavor to assume less knowledge, and in a simple way to describe the symptoms in a negative which call for this or that treatment. Thus, the monograph is, among other things, a treatise on intensification and reduction and so replaces No. 74 of The Photo-Miniature, now long out of print. But it cares nothing for either process except as a means of turning a poor negative into a good one or at any rate a better one. On which account I hope our adventure will commend itself to the reader desirous of getting the largest possible returns in his work with the camera indoors and out.

The Black Sheep of Normal Development

Nowadays the improvement of the negative requires to be considered somewhat differently from the view taken of it, say five years ago. Then we did all we could for the negative in the developer. Nowadays when "tinkering" with the developer is a discarded method among thousands of photographic workers, things are not quite the same. We put our batch of plates or spool of film in a tank and, for weal or woe, pledge ourselves to the result of a certain fixed time of development. That is a method which we may call "normal" development, as distinguished from the "correct" development which old-time workers, and many today, prefer to describe the process in which they take the plate

out of the solution when they judge it to be properly developed, or may use other variations of the developer to make the best of incorrect exposures. There is nothing to be said against these older methods. They form the working knowledge of the most skilful photographers and a recent issue (No. 139) of THE PHOTO-MINIATURE is devoted largely to them. I mention them here to emphasize the fact that the normal or time method of development is liable to give rise to certain types of negative consequent upon under- or over-exposure of the plate. These are the thin and somewhat hard negatives—due to under-exposure, and the somewhat dense but flat negatives resulting from developing an over-exposed plate for the normal time. Such negatives are the occasion of much of the disappointment which a tyro feels in his early efforts in development and I may well deal first with them. They cover most of the amateur's failures.

Negatives Thin and Hard

My brief specification means just what it says, viz: a negative which is both thin, as regards most parts, and particularly thin and weak in the less lighted parts of the subject, and yet for all that yields a print of "hard" or harsh apppearance owing to the intense unrelieved blackness of the shadows. Often in such negatives the shadows are perfectly bare glass. Often there is a veil or slight deposit of fog. In either case, one cannot expect a proper rendering of the detail in the subject. Detail is seen only in the better lighted parts of the subject. In the most strongly lighted parts, such as the face in a portrait, the tone will be only a little lighter than in a print from a good negative. It is so, if development has not been pushed so far as to increase the deposit in the high-lights. But if development has been pushed too far, the high-lights print whiter than they should without the shadows being any less black. Usually with time-development, the evil does not go on to this farther stage—that is a merit of the time system—but the question is what is the best thing to be done with a negative of this kind. Most intensifiers will only make matters worse than before. The best means of

improving the most unimprovable kind of negative is the uranium (single-solution) intensifier.

The Uranium Intensifier

This intensifier is made from two stock solutions: (*A*) uranium nitrate, 200 grs; water, 10 ozs; and (*B*) potass ferricyanide, 200 grs; water 10 ozs. The working solution is: (*A*) 1½ ozs; (*B*) 1 oz; acetic acid (glacial) 2 drams. This ready-for-use mixture does not keep long—for an hour or two—and should be thrown away after use. The solution will serve to intensify several plates in succession, but the essence of its action is that it should tone the negative quickly—in less than five minutes—on the surface to a bright coppery red. The object is to bring up the shadows as much as possible whilst forming the minimum deposit on the denser high-lights. The shadow parts may reach the coppery stage before these denser parts. All the better, therefore watch the plate carefully for this effect.

How to Use It

The negative must be perfectly fixed, and be washed free from every trace of hypo, which causes dark patchy stains when the plate is in the intensifier. Flow the solution over the negative and watch the black image gradually change through brown and reddish brown to the coppery color. Don't wait when you judge the right stage is reached, but take the plate out of the solution at once. Transfer it immediately to a large dish of still (not running) water in which move it gently about for half a minute or so. Then let it have three five-minute soaks in still water, when the general yellow stain of the intensifier should be gone and the negative can be mopped with chamois wash-leather and put to dry. The reason for the still water is that the intensification is removed by the faintly alkaline salts in tap-water. Hence, uneven action in a current of water. A weak solution of soda carbonate or ammonia will almost instantly remove the copper-colored deposit restoring the negative to its original state. Thus the process can be repeated, but to a lesser degree, if the full action produces too much contrast. Before a second application the soda carbonate must be got rid of by a ten-minute wash, and

it is just as well to "kill" any remaining traces of it by putting the plate in a bath of weak acetic acid for five minutes before re-applying the intensifier. No need to wash out this acid; the intensifier is itself acid.

Apart from hypo-stains, about the only trouble with this intensifier is the reluctance of the yellow color to clear from the shadows of the negative in the quiescent wash water. Immersion of the plate for a minute or so in a 10 grains-per-ounce solution of ammonium sulphocyanide will put this right.

Negative, Weak and Extra Hard

Let us take a glance at the more hopeless form of negative, viz., one in which the shadows are also clear (or slightly veiled) and without detail; but the high-lights much more dense and white-printing than the one we have just considered. Such a case is about as bad a one as we can have to deal with. The uranium intensifier will scarcely improve matters of itself. The best suggestion I can offer is to make a positive transparency by contact from the coppery negative and from this transparency by contact again, a second negative. At each stage in this process give a full exposure and avoid over-development, so as to reduce the harshness of gradation, and to obtain all the shadow detail without excessive density in the high-lights. A dry-plate of "ordinary" or "landscape" speed is about the best for the purpose, and for developer any formula, e. g., metol-hydroquinone, which does not readily give contrast. In neither the transparency nor the second negative should there be any perfectly bare glass. If this point be adhered to, development of a slow plate will do a good deal toward securing a reproduced negative in which detail in both high-lights and shadows can be printed—particularly on a soft-working development paper.

Another Method

There is another quicker and really more effective way of making an improved negative from one of these nearly hopeless cases, and that is to bleach it with a saturated solution of mercury bichloride ("mercury bleach"). This converts the negative into a white positive when viewed from the glass side, and the posi-

tive is always immensely softer and better in detail than the original negative. It can be backed up with black velvet and a second negative made by copying with the camera, the glass side of the "positive" facing the lens. In using this process it is best to render the positive somewhat more brilliant than it is as the result of bleaching only, which is done by immersing it for a few seconds in a very weak solution of soda sulphite. A grain or two per ounce of water is enough, and the action must not be allowed to go far, otherwise the whites of the positive will suffer. The sulphite brings out the picture with a little added strength, and as soon as it has done that, rinse the plate under the tap, dry it away from the light and copy without unnecessary exposure to strong light.

Negative, Flat and Dense

Here again I mean a negative which has both of these qualities at once, as many have from considerable over-exposure and about the normal time of development. Get rid of the idea that density (blackness) in a negative means contrast. A negative may be so dense as to take hours to print on Solio or other print-out paper, and yet yield a flat result. Such excessive density is a nuisance. Fortunately it can be easily remedied and, at the same time, to a certain extent, the flat gradation much improved. The remedy is the hypo-ferricyanide, or Farmer's Reducer, used in a particular way for this special purpose and followed, if necessary, by intensification.

Farmer's Reducer

This much-used reducer consists simply of hypo and potass. ferricyanide (red prussiate) dissolved in water. The mixture does not keep more than a few minutes but is very easily prepared by adding a few drops of 10 per cent ferricyanide solution to a clean hypo solution of strength, about 2 or 3 ozs. of hypo in 20 ozs water. Plain clean hypo solution must be used, not used fixing bath or "acid" fixer with sulphite or metabisulphite in it. Both lead to yellow staining of the negative which is very difficult to remove.

The more ferricyanide is added, the more energetically the reducer acts and the color of the mixture is a

fair indication of its activity. With a little ferricyanide, it is lemon-yellow or paler; as more is added, the solution becomes of an orange tint. Both weak and strong have their special uses since the strength has an effect other than speed of action. Whatever the strength (dose of ferricyanide), Farmer's reducer exerts its action proportionately more on the light tones of the negative (shadow detail) than on the heavy deposits forming the high-lights, but this action is very pronounced with a strong reducer and becomes less and less marked as the solution acts slowly. In other words, the reducer "eats out" the lower tones as compared with the high-lights and so produces more contrast at the same time that it reduces the general density of a negative.

Reducing Dense, Flat Negatives

For the special need of negatives of this sort, therefore, we want a strong orange-colored reducer, and we can further emphasize its effect by applying it to the film with a plug of absorbent cotton instead of letting the negative soak in it. That makes a very great difference, for it aids the characteristic action of the reducer on the surface only of the film. The high-lights in the image of a dense flat negative necessarily extend well down into the film: the shadows of the image lie near the surface, where also is a layer of fog produced in the course of development. Strong Farmer's reducer will first clear off much of this superficial fog without touching the image proper, which latter it then attacks more in the shadows than in the high-lights. Result, a simultaneous clearing away of general fog and of deposit on the shadows with consequent increase of contrast throughout the image generally.

How to Work

Mix the reducer of full orange color, soak a tuft of absorbent cotton in it and squeeze most away again. Then rub this well-wetted pad over the negative for a few seconds, rinse the negative under the tap and reapply the wetted pad of cotton, repeating this process until the shadow parts are seen to be approaching something like clear glass when the negative is laid

on white paper. You don't want to go as far as bare glass in the deeper shadows, even if you can do so without losing too much deposit in the high-lights. The negative is all the better for a slight deposit over the shadows, and usually in reducing a really poor negative of this description one has either to stop short of this slight deposit, or to go on until bare glass is obtained in the very deepest shadow and then restore deposit to the high-lights and middle tones by intensification. Therefore keep an eye not merely on the general appearance of the negative, but on the way shadows and high-lights are being modified by the reducer. A little experience will teach you whether you can get enough contrast and at the same time enough "body" in the high-lights with the reducer alone or require to go a little further and build up again with an intensifier.

If an intensifier is judged necessary, the negative requires to be thoroughly washed and then brought up to the necessary vigor with one or other of the formulæ recommended below for "negatives below par" or "negatives, thin and flat" as its appearance suggests.

Clearing Ferricyanide Stains

The yellow stain sometimes caused by Farmer's reducer is not easy to remove. A solution of ammonium sulphocyanide, 5 grs. to each ounce of water, will sometimes clear it off. Other means are: a 10 per cent solution of soda sulphite; or a solution of alum 30 grs. and nitric acid, 30 minims in 10 ozs. of water. Apply these clearing solutions in each case after half an hour's washing to remove hypo. Stains are more liable to occur with a strong reducer than with the pale yellow and weak solution; but if the strong solution be constantly rinsed off and re-applied, there is very little chance of stain. Actually in regular use of the hypo-ferricyanide reducer it is very exceptional to get a stained negative.

Negatives Below Par

In the foregoing we have considered two kinds of negative which, in the use of time development, one is most likely to produce as the result of incorrect exposure. It is impossible, however, to make a sharp

classification of negatives, in respect to their defects of flatness or hardness, for one class merges imperceptibly into another. Still it is practicable to specify precise types sufficiently to be of service. By a "negative below par" I mean one which is somewhat too thin and "soft" or "flat" in character: one that shows insufficient contrast between the darkest shadow and the highest light. Such negatives will turn up in tank development as the result of development for too short a time, or more often for the normal time at too low a temperature, and are often made when developing on the old plan, i.e., in tray development, by an error in judging the density in the darkroom. They call for a slight degree of intensification, enough to give them the greater "pluck" or vigor which they would have acquired on longer development. You can tell a negative of this kind by its good detail everywhere, its clean shadows and the rather thin appearance of its middle tones and high-lights. As my good reader doubtless knows, such a negative will yield a fairly good print on a "contrasty" brand of development (gaslight) paper, though too flat for bromide print-out, platinum paper or the carbon process. The choice among soft-working and hard-working printing papers is now so great that defects of negatives in the way of too great or too little contrast can be greatly obviated by appropriate selection of the printing process. Nevertheless we still recognize the good brilliant negative which prints equally well in any process (the contrasty development papers alone excepted) and it is this standard which we aim to reach in the use of intensifiers and reducers.

The Mercury Intensifier

For the "below par" negative the process which is in every way the best, as regards permanence, certainty and yet power of adjustment is one which is perhaps more trouble than any other, viz., mercury and ferrous oxalate. Briefly the negative is bleached in solution of bichloride of mercury and darkened with the now obsolete ferrous oxalate developer. As Mr. Chapman Jones has shown in numerous papers, it is the only intensifier which exactly gives the effect of longer devel-

opment. It jumps, as it were, the negative forward to a degree of contrast such as it would have reached by a little longer development. It is not much of a gain in contrast but it can be repeated by again bleaching and darkening, and the second jump is rather greater than the first. And if that even is not enough it can be repeated again, or a smaller jump made by using soda sulphite solution instead of the ferrous oxalate developer. The result is as permanent as the original negative and is free from the erratic action of some other mercury intensifiers. So much for the virtues of the process. Now for its practice.

Mercury Bleach

The mercury bleaching solution is a saturated solution of mercury bichloride (corrosive sublimate) made slightly acid. Powder the heavy fibrous-looking crystals, dissolve about 1½ ozs. in 20 ozs. of water, and leave to cool. Part of the chemical will separate out in fine crystals, showing that the solution is saturated. Pour off this saturated solution from the crystals into a clean bottle, add to it half a dram of strong hydrochloric acid and label it "Mercury Bleach—Poison." Don't add the acid to the solution with the crystals still in it: more mercury salt is thereby caused to dissolve and the solution is liable to cause a network of markings (reticulation) on a negative when ammonia is used as the darkening agent (see later). The mercury solution keeps indefinitely and can be used repeatedly.

Ferrous Oxalate Developer

This is made by mixing, at the time of use, saturated solutions of potash oxalate and ferrous sulphate (green vitriol). The oxalate solution is made by stirring about 1 lb. of oxalate with about 40 ozs, of hot water in a clean pitcher. Pour off whilst hot into stock bottle, when crystals should separate on cooling. This solution also keeps indefinitely.

The ferrous sulphate solution will not keep longer than a few days, and is best made by grinding up half an ounce of the salt with just over an ounce of cold water. The developer is made by measuring out just enough of the oxalate solution to cover the plate and adding to it one-sixth of its bulk of the ferrous solution.

Intensifying with Mercury The plate requires to be thoroughly washed from hypo. If it has dried, it should first soak in water for half an hour. If it has become horny with age, it is well to soften it by half an hour in a bath of acetic acid, ½ dram; water, 1 oz.; afterward rinsing. Let the plate soak in the mercury bleach until *very nearly* bleached through the film to the back. The bleach will complete its work in the washing tank, and less time is then required for washing out the mercury. In any case this wash must be thorough, say an hour, in order to insure clean results. Lack of ample washing at this stage is the most common cause of failure.

Pour the ferrous oxalate developer over the bleached negative, let it act until all whitish appearance is gone from the back of the plate, and wash for half an hour. Before putting the negative to dry it is well to rub its surface under water with a piece of clean wash-leather which pretty well clears it from deposit of oxalate of lime due to hard tap-water.

One application of this process gives a fair though not a great degree of intensification. A second application is as much as is almost ever required. The use of soda sulphite (1 oz. in 20 ozs. of water) in place of the ferrous oxalate gives a very slight amount of intensification, just about enough to impart a little "snap" to a negative which is nearly all it should be. It differs from ferrous oxalate in not calling for the same thorough washing of the bleached negative. Five or ten minutes are sufficient. But it is apt to disappoint as a darkening bath if the negative calls for more than a mere touch of extra contrast.

Mercuric-Iodide Intensifier While intensification with mercury and ferrous oxalate is ideal in the respects I have mentioned, it is a tedious business on account of the length of washing for removal of hypo and after bleaching. Of other speedier methods, very suitable for the thin but otherwise decent negative, decidedly the most useful is that of Lumière, in which the plate visibly gains in vigor in a solution of mercuric-iodide and soda sulphite. For a moderate degree of extra density it is

excellent and calls for only a wash of ten or fifteen minutes after the fixing-bath. The salts for the solution are supplied by Lumière in powder form and by other chemists as tablets, or can be compounded by making a solution of 4 ozs. soda sulphite in 20 ozs. of water and then dissolving in it 90 grs. of red mercuric iodide. This solution keeps well in the dark and can be used repeatedly. The negative steadily builds up density in it in from five or ten minutes, becoming brownish in color. If washed and dried at this stage, the negative will turn yellow in time whilst remaining quite printable. But this can be prevented by treating the plate (after washing for a few minutes from the intensifier) with any non-staining developer. The latter produces little apparent effect; let it act for as long as required to develop a negative fully, say seven or eight minutes. The results are then quite permanent.

Chromium Intensifier

Next to mercuric iodide, in order of practical utility with thin but not fogged or hard negatives, I place the chromium intensifier. It is a two-step method—of bleaching and re-development—and like the mercuric iodide calls for only a short wash of the hypo-fixed negative. The bleaching solution is made by mixing equal parts of (*A*) potass. bichromate, 1 oz.; water, 25 ozs.; and (*B*) hydrochloric acid, strong, 1 oz.; water 50 ozs. Both *A* and *B* keep indefinitely but the mixture should be made only at the time of use. The negative quickly bleaches and must then be washed clear of all yellow stain, which takes about twenty minutes in running water. It is then darkened in any energetic non-staining developer. Amidol as used for negatives is excellent; so is metol-hydroquinone but without bromide. So also is the hydroquinone formula, given for this purpose in "Figures, Facts and Formulæ" (The Photo-Miniature, No. 134) viz., equal parts of (*A*) hydroquinone, 20 grs.; water, 5 ozs.; and (*B*) caustic soda, 40 grs.; water; 5 ozs. If amidol is used there is no need to expose the bleached plate to daylight, but with other developers it is necessary as a rule to let the developing action go on in diffused daylight in order to ensure the full degree of intensification. Let

the developer act through the back, wash for five or ten minutes and dry. One application of the process yields very considerable intensification, which can be doubled, if the negative requires it, by carrying through the process a second time. Points in the use of this intensifier: Don't bleach longer than necessary, that is until the plate has lost all gray appearance on the back and shows a brownish buff image through the yellow stain. Don't expose the bleached negative to strong light (sunlight) during washing or re-development: diffused daylight or artificial light is harmless, but it is as well to wash in a tank, not in an open dish. Use an energetic developer, e.g., amidol of strength, 5 grs. per ounce. Bleaching should take two minutes; washing, twenty minutes; re-development, about five minutes.

Negatives Thin and Veiled

A type of negative which the beginner who develops haphazard often gets in his early attempts is one which has detail everywhere but is wretchedly flat and has no part free from a thin veil or deposit. In printing, the shadows appear weak and washed-out instead of a vigorous black, whilst the high-lights are gray instead of white. A negative of this kind is the result of great over-exposure followed by development for too short a time. Such a plate comes up quickly in the developer and quickly darkens over. Hence the beginner takes it out for fear of losing what poor result there is. If he kept it in longer, as he would do when using a "time" method, he could not be any worse off—and probably would get something a good deal better, by reducing the flat but dense negative with hypo-ferricyanide, as I have already described.

When the flatness is greater and the density less, it is not so easy, but there is one intensifier which will make a very marked improvement in many a negative of this kind. This we will now deal with.

Monckhoven's Intensifier

It is a two-step process in which the negative is bleached with mercuric bromide and darkened with cyanide of silver. The bleacher is made by dissolving 100 grs. of mercury bichloride and the same quantity of potass. bromide (separately) in separate 5-oz. lots of water, and

mixing the two to form the stock solution, which keeps well. The darkening bath is compounded by dissolving 100 grs. of silver nitrate in 10 ozs. of water (disregard the milkiness when tap-water is used), and adding in small doses 100 grs. or more of potass. cyanide dissolved in 1 oz. of water. [NOTE. Cyanide is a deadly poison.] As the cyanide solution is added it throws down a whole mass of curdy deposit which dissolves again as more cyanide solution is added. Stir continuously, and stop adding cyanide whilst there is still some deposit in the mixture. Then pour off the clear liquid which keeps fairly well.

Method of Use

Our flat, veiled negative (thoroughly freed from hypo) is first bleached and well washed, and then flooded with the silver-cyanide solution. The action of this latter is unlike that of other darkening agents. The solution first darkens the whole image but does not stop at the degree of darkening produced within the first minute or so. On the contrary the further action is a reducing one, the negative in time going back to pretty much as it was before bleaching. A little of this reducing action is no disadvantage as it seems to be exerted more on the shadows than on the highlights and thus increases contrast. But in any case the intensifier produces very intense action—too much so for a negative which is passable at the start.

Mercury-Cyanide-Iodide

A similar effect to the above is obtained by bleaching the faulty negative in the acid "mercury bleach" already prescribed for the ferrous-oxalate darkening bath, washing for a few minutes and then placing in a solution of: Potass. cyanide, 45 grs.; potass. iodide, 20 grs.; mercury bichloride, 20 grs.; water, 20 ozs. Here it passes through a succession of changes. It first becomes yellowish and appears weak in contrast. Then it quickly deepens in color to a dark brown acquiring great density and vigor, and next enters on a further stage during which the color becomes a lighter brown and the deposit less opaque, and the result somewhat less contrasty. The final stage, however, represents a heavy degree of intensification.

Mercury and Ammonia Method

Still another method is that of whitening the negative in the "mercury bleach" (given on page 534), washing and then darkening with ammonia solution, of strength about 15 drops stronger ammonia water .880 to 1 oz. of water. Although this is a process which in the past has long been the most widely used intensification method, it is not at all a good one for regular work. Its action is uncertain owing to the fact that the ammonia has a dissolving as well as a darkening action on the bleached plate. But with a flat, thin and veiled negative it is well suited for improving matters. As regards yielding contrasts, it is not so vigorous in its action as the Monckhoven or iodide-cyanide formula just given.

Mercury Permanence

Before leaving these intensifiers of flat veiled negatives, I ought to add a caution. You cannot depend on the permanence of the results obtained with the Monckhoven, iodide-cyanide or mercury-ammonia formula. Individual workers have claimed results with one or the other to be fully permanent and so perhaps they can be with meticulous care. But general experience shows that the processes, when worked as the average man will and must work them, do not yield images which last indefinitely. They last, however, for months at any rate which often is long enough: If not, it is an easy matter to make a positive transparency from the negative and from that a duplicate negative by the method described on page 529.

A Warning

Moreover these intensifiers, as you will understand, play havoc with the gradation in the negative in the sense that they do not maintain the same relations of tones as does continued development. The mercury and ferrous oxalate developer is actually the only one which does this perfectly, but the other intensifiers I have named, such as mercuric iodide, chromium, mercury and sulphite preserve the tones relatively to each other fairly well. My last trio are freakish in comparison with them, and while useful for their special purpose, should never be used for a negative the tones in which

are considered relatively right, and to require only proportional intensification.

Negative Dense and Hard

That is, one in which the shadows are fairly free from deposit, the middle tones dense, and the high-lights almost completely opaque. Result, in the print, either the merging into one black tone of what should be distinct degrees of shadow (if the exposure is enough to render detail in the high-lights), or, on the other hand, white detailless high-lights (but better rendering of the shadows) if less exposure is given. There are degrees of hardness according to the degree of over-development the plate has received, and, in conjunction therewith, the degree to which the plate has been under-exposed. Much under-exposure is shown by lack of shadow detail and little density anywhere in the negative except the high-lights.

I have already dealt with such a "negative, thin, and hard." Here we have to consider a negative which, as a whole, is a slow printer, and yields prints of the character just described. The remedy is reduction of the density. The negative is only slightly too hard, the hypo-ferricyanide (Farmer's) reducer serves quite well, but it must be weak, i.e., slow-acting, and pale yellow in color. It is advisable to start with only a drop or two of ferricyanide solution in 4 or 5 ozs. of clean hypo bath, adding more if the action is unduly slow. Ten or fifteen minutes is not too long a time for a moderate degree of reduction, and, if the negative is reduced thus slowly, the loss of shadow-detail (before sufficient weakening of the high-lights has taken place) is largely avoided. But a negative which is positively hard is spoilt by using Farmer's reducer. For such negatives, the reducer needs to act on the high-lights rather more energetically than on the shadows. The most usual reducer of this kind is persulphate of ammonia.

The Persulphate Reducer

The reducer consists of from 10 to 20 grs. of ammonium persulphate dissolved in 1 ounce of water, with a drop of sulphuric acid preferably added. The solution must be made at the time of use. The

gelatine film must be thoroughly softened by soaking, the dish constantly rocked from the time of pouring on the solution and the effect closely watched. Persulphate works rather peculiarly. Often it is slow in exerting any action, then a kind of whitish cloud rising from the negatives shows that it is beginning to act; and usually it then acts energetically. Hence it is necessary to use a bath which will stop its action smartly (viz., one of 1 oz. soda sulphite in 20 ozs. water), and also to take out the plate, if anything, somewhat before sufficient reduction has been obtained. While persulphate is a valuable reducer, it requires knowing; also it is important that the negative should be both thoroughly fixed and washed. Usually the reducer works best with a negative which, though harsh, is clear in the shadows.

Reduction by Re-development

An alternative method of dealing with a hard, dense negative which is more under control than persulphate is to bleach the negative completely, as in the sulphide toning process used for prints, and, after washing, to re-develop with a rodinal solution well restrained with bromide. This amounts to conducting the development of the plate afresh, with the daylight facility of judging when the image has gained just sufficient contrast. The bleaching solution is: Potass. ferricyanide, 300 grs.; ammonium bromide, 100 grs.; water, 20 ozs., which should act completely on the negative, leaving a pale buff image, in about five minutes. After a wash of fifteen to twenty minutes, the negative is re-developed in: Rodinal, 1 dram; 10 per cent potass. bromide solution, 5 drams; water, 6 ozs. This is a very slow-acting developer, but the plate can be left to itself to come up steadily. Examined on the glass side, the image shows as black first in the lighter parts, the heavier deposits retaining more or less of the appearance produced by the bleaching. When the required degree of vigor is obtained, the plate needs only to be passed for a minute or two through a hypo bath, and washed.

I might mention here that the negative in the bleached state, after washing and drying, can be printed

from, if an ultra-soft effect is required. The expedient is of service for subjects such as draped portraits, snow or ice in sunshine, when the contrast in the original negative is excessive.

Afterwork by Hand Methods

In plenty of negatives, the portion which suffers from excessive density is so sharply outlined that it is an easy matter to make the desired improvement without tampering with the whole plate, viz., by rubbing down the dense patch or obtaining an equivalent result by strengthening all other parts but this. By this method it is possible to make modifications which are beyond the scope of a reducer or intensifier and, moreover, it is often possible to remove the whole of the work, if the effect is not satisfactory, and to start afresh. This field is a wide one, the methods, as many, almost, as the workers in it. But the processes which are of everyday utility, yet do not call for the skill of the practised retoucher, number only two or three. Nevertheless, they do practically all that is wanted in the way of removing the defects which are commonly met in an amateur worker's negatives.

Rubbing Down Density

For rubbing down the dense parts of a negative, and so rendering them printable, the old method of friction with smooth chamois leather moistened with alcohol is still among the best. Lay the negative on two or three thicknesses of blotting paper, which in turn rest on a flat surface, such as a piece of plate-glass. See that both negative and wash-leather are perfectly dry. Then, drawing the leather over the first finger, moisten it only slightly with a good quality of alcohol. Then rub vigorously and with plenty of pressure. The blackening of the leather indicates how the work is going at the start. As the deposit is removed, you can test your progress by taking a rough pull on a scrap of print-out paper. It is not a rapid method and, with a heavy deposit to rub down, is apt to become tedious. Still, I recommend the beginner to make himself proficient in it before practising the quicker means of abrasion, which call for greater skill in use. Of these, the simplest is rubbing down with

a leather, as just described, but using instead of the alcohol, a mixture of equal parts of salad oil and terebine into which is stirred enough of some polishing paste (as sold for the cleaning of domestic metal goods), to provide an abrading action. With this mixture on the leather the negative film is rubbed down with much less expenditure of time and labor. The danger is to do too much, and the same caution applies to the several varieties of abrasive pencils in the market. Some of these are used with a medium rubbed on the negative, while others are used dry, and provide an easily mastered method of making improvements which the professional retoucher achieves as the result of infinitely greater skill with a knife.

Halation

I interpose here a note on the removal of the unsightly effect of halation from the negative, because the rubbing-down method enables this form of "density in the wrong place" to be easily remedied. My readers have perhaps discarded negatives in which the blur of light around windows or openings in foliage has hopelessly marred an otherwise perfect result. Simply use the leather, with alcohol or the abrasive mixture, as already directed. You will find that rubbing over the whole area, without endeavoring to confine the treatment exactly to the halation itself, automatically brings out the parts which are merged in the spread of density.

Strengthening Parts by Hand

The alternative plan of softening hard parts of the negative is to coat the whole back of the negative with some sort of film, and to apply color, chalk, or pencil everywhere around the part which is to be made relatively lighter than the rest. This system has been carried out in all sorts of ways in the past, but chiefly by coating the back of the negative with matt varnish and working on this with a soft pencil, with a conté crayon, or with black stumping chalk applied with a leather stump.

Use of Papier-Mineral

Another plan is to stretch the fine-grained "papier-mineral" on the back of the negative, and work on this in the same way. The negative is placed in a retouching

desk or in a tilted printing-frame, so that it can be seen while the work is being carried out. The trouble is that it cannot be seen at all well, owing to the semi-opacity of the varnish or paper; and that, I think, is why beginners fight shy of these methods.

A Work-up Varnish

A vast improvement, however, as regards ease of working, has been made by the introduction of a coating for the glass side, which is perfectly transparent, yet takes pencil or stumping-powder readily. This varnish is a mixture of equal parts of (1) 2 per cent solution of celluloid in amyl acetate, and (2) best methylated or denatured alcohol. It is flowed over the back of the negative like a cold varnish, and dries in about two minutes. Then every mark can be seen as it is applied, the intermediate thickness of glass softening the hand-work when the negative is printed. A commercial preparation, "Bildup," is compounded on the above lines, and offers a ready means of practising the method.

Demonstration

For example, in a portrait negative, hands and collar are of excessive density and form distracting white patches in the straight print. The case is a common one in amateur portraiture where, as a rule, special pains are not taken to control the lighting. But coat the back of the negative with this work-up varnish, and with pencil or a special stumping graphite work up the whole surface, with the exception of hands and collar. Try the effect by taking a proof. If too great, the coating can be cleaned off in a few seconds with a little amyl acetate on absorbent cotton and a fresh start made. If not enough, more work can be put on, though it is usually more satisfactory to put on the bulk at the start.

Another example: a landscape—with, say a foreground of foliage, the detail in which, when the high-lights are properly rendered by full printing, is one mass of black deposit (in the print). Here the remedy is working on this part of the negative (on the glass side), so as to retard it in printing; and, again, it can be done to any reasonable extent and cleaned off if the first effect has gone too far or not far enough.

Of all hand methods which can be used for making good the defects in a negative which arise from faulty development or from the character of the subject itself, there is none which serves the purpose of the beginner so well as this, and so closely approaches the results obtained by the professional retoucher by work on the film side with knife and pencil.

Developer Stains

Stain from a developer is usually even over the whole negative, as distinguished from patchy stains which may occur from other causes. The remedy varies according to the developer, though none is infallible. A dense deep-seated stain is difficult to remove, more difficult, the older the negative; and it must be borne in mind that the more powerful stain removers are apt to touch the silver image itself, reducing its intensity. Hence, of late years, the plan has been adopted of first bleaching the negative, i.e., converting the silver image into bromide or chloride. In this state, the negative can be treated for removal of the stain with chemicals which would attack the silver image in a few seconds; the bleached image, however, withstands them for as long as fifteen minutes. Very obstinate stains can thus be removed, after which the plate is re-developed, as advised below, to restore the image to its original state.

Working Method

A working method embodying this principle is as follows: Bleach the negative in: Potass bichromate, 200 grs.; hydrochloric acid, 100 minims; water, 20 ozs. Wash clear of yellow stain (15 to 20 minutes) and then immerse in the powerful stain-removing solution: Potass. permanganate, 6 grs.; Sulphuric acid, ½ dram; water, 5 ozs. In this, most stains will disappear in a few minutes but the solution can be kept on for 20 minutes, in which time the most obstinate stain will yield.

While dissolving out the stain, the permanganate itself deposits some brownish oxide of manganese which is next cleared off by a dip in 10% soda bisulphite or potass. metabisulphite solution. After a few minutes' wash, the image is re-developed, preferably with amidol. The above method is a general one,

applying to any developer stain. While it is a very thorough process, I don't think it is worth the trouble in solution-making etc., unless the stain is of a very severe kind. Usually one doesn't want to remove stain absolutely, but simply to reduce it to a degree at which it does not delay printing or enlarging; and for this practical purpose other milder and less complex methods amply suffice. These, as I have said, vary according to the developers. The principal variations are covered, in the following paragraphs, with formulas.

Pyro Stains

Moderate pyro stain is cleared off by soaking the negative for 10 or 15 minutes in: Chrome alum, ½ oz; citric acid, 1 oz.; water, 20 ozs. This bath keeps fairly well and can be used repeatedly. A more active remover of pyro stain is: Thio-carbamide, 90 grs.; citric acid, 90 grs.; water, 20 ozs. Another handy method is to put the negative for half an hour or so in an old combined toning- and fixing-bath, as used for print-out paper. Still another with which I have got rid of dense stain from very old negatives is simply to paint the negative with a mixture of about equal parts of glycerine and very strong hypo solution, and to stand it aside for a day or so.

Hydroquinone Stain

This is a bright yellow and scarcely touched by solutions which get rid of stain from pyro. The best means I know is the hypo-ferricyanide reducer, used weak, i.e., pale yellow in color. This will usually remove the yellow stain before it has a chance to reduce the silver image.

Amidol Stain

It is rare to get negatives stained by this developer, but, when the stain does occur it is a difficult one to get rid of. A solution which will usually remove it is: Washing soda, 50 grs.; soda bicarbonate, 4 grs,; chloride of lime, 10 grs.: water, 1 oz. Beware of keeping this solution on too long, as it softens the gelatine powerfully. If the stain does not yield to it in 5 or 10 minutes, I should try the bleach and permanganate method given above. The negative, of course, must be washed for half an hour or so after the chloride of lime bath.

Silver Stains These are generally caused by contact of the negative with print-out paper in the presence of much moisture, due to excessive dampness of either, or to wet getting in between the two. The stain usually comes as patches of dark brown color and, as it consists of silver, as does the image on the negative, its removal without touching the image is a somewhat delicate business. Fortunately the stain is much more easily acted on than is the negative, and so it is possible to remove it whilst leaving the latter intact. The safest, and usually a most effective method is to rub the dry negative with an abrasive metal polish for a minute or two with a tuft of absorbent cotton, and then to put the plate to soak in strong hypo solution. Here the stain gradually disappears—in minutes or hours according to its depth and age. A more drastic method, but attended with some degree of risk, is to soak the negative in a solution of potass iodide (20 grs.) in water (1 oz.), washing, and then rubbing the stain with a little fairly strong solution of potass. cyanide on absorbent cotton. A final resort is to use solution of iodine (about 10 grains) in denatured alcohol (1 oz.), in place of the iodide solution. Stop its action as soon as the stain becomes yellow, then washing and using the cyanide.

Pinholes Transparent spots in a negative are touched out either (1) with some blocking-out medium applied with a fine brush, or (2) by penciling, after coating the film side with a medium which takes the pencil.

Method No. 1 For this I prefer to use a commercial stop-out medium, commonly sold as "opaque" under different makers' names. A favorite home-made mixture is India ink and Paynes' gray—the water-color chalks ground with water on a bit of opal. The brush is all-important. It should be a fine red sable pencil of No. 1 or No. 2 size. To spot or actually to fill the transparent spot with moist color, place the brush in water and press it against the side of the vessel to expel most of the water. Then take up color by twirling the tip of the brush on the block or on the mixture on the

palette. In doing this, hold the brush as nearly as you can in line with the palette; not upright over it, which can easily damage the hairs. Point the brush by drawing it always in the same direction, on the palette, and it is ready for action. The body of it should be charged with water; only the tip with color. To apply the color, touch the spot very lightly with the extreme point, holding the brush about perpendicularly to the negative, and letting it dwell for a second or two. If it is a large hole, several touches are needed, but put the negative aside for a minute or two, for one spot or touch or coating of color to dry before applying the next.

Method No. 2

For touching out with pencil, the thin celluloid coating directed in an earlier paragraph on "Strengthening Parts by Hand" is flowed on the film, and the spot penciled out with a fine-pointed Hardtmuth, No. 1. Most beginners, I think, will find this latter the easiest method; for spotting with brush and color calls for a certain knack. It is, of course, the more rapid method, once the knack has been acquired, but at the start the spotting is apt to be more disfiguring than the spots, due to color spreading around the spot. Whichever method is followed, it is best to err on the dark side, since the spot becomes a light point on the print, and is very easily touched out with water-color to match the tone of the finished photograph.

Scratches on Glass Negatives

The remedy for a negative which has been badly scratched on the glass side is to clean the latter perfectly, warm the plate slightly, and lower it, glass side down, onto a clean, warmed glass plate, on the center of which a few drops of thick Canada balsam have been poured. Place the two plates on a warm slab of brick or iron, and apply a gentle pressure until the Canada balsam exudes from the edges. Then allow to rest until cold and firm.

Scratches on Film Negatives

The scratches which are very easily made on the backs of film negatives by careless handling can be largely remedied for temporary purposes by coating with a weak solution of fish-glue or seccotine. Mix

the thick adhesive with water until of such consistency that you can spread it easily with a soft brush, but without its running. Let the coating dry, which it will do with a glossy and even surface which renders most of the scratches invisible. It is best to remove the coating when the negative has been used, as may readily be done by soaking in plain water, aided by a little rubbing. If left on, the surface is liable to stick to its envelope or to another negative, if by chance it be kept in a moist atmosphere.

Stripping and Transferring a Film

If the back is very badly scratched, it may be necessary to transfer the gelatine film to a new support of celluloid or glass. This can be done by soaking the negative in: Caustic soda, 20 grs.; formalin, 20 drops; water, 2 ozs., for about ten minutes. This loosens the film, which detaches itself if placed in a bath of 2 ozs. of water, containing a drachm each of glycerine and hydrochloric acid. Here it is easily floated off, expands slightly, and can be transferred to a fixed and washed plate or film, pressed down, and left to dry slowly in a current of warm, dry air.

Blocking Out

An unsightly background is so emphatically a defect in a negative of a subject such as a machine-tool, an automobile, or a race-horse, that I should include methods for its removal in this monograph. If the subject is one of fairly clean, sharp outlines, such as those just named, the best plan is to use an opaque. The bulk of the outline is followed with the opaque on a brush, in selecting which choose a fairly large size with a fine point. With a small brush, as used for spotting, constant dipping in the color makes the work tedious. Straight lines can be ruled on with a steel pen, such as a "Waverly" or a draughtsman's drawing pen. Clogging by the drying of the opaque is avoided by feeding the mixture on to the pen with a camel's hair brush. Put only a little on the nib and wipe over the print with the brush each time it is used, to draw an opaque line, but don't dip the pen in the opaque. In working to the outline in the negative, it is better to stray over on to the subject than to leave any of the

background showing on the print. It is easy to spot in a nick in the outline, but very difficult to get rid of a dark line beyond it. Usually it suffices to block out with opaque a quarter of an inch round the subject, and to cover the rest of the background with a mask from a print-out proof from the negative by cutting out about ⅛ inch beyond the outline of the subject, letting the paper blacken, and fixing it to the negative with a few touches of cycle-tire rubber solution.

Blocking-out on the Film Side

It is in blocking out negatives of subjects the outline of which is delicate that the beginner experiences most difficulty. Examples: Hair and light drapery in a portrait; rough-haired dogs and other animals; foliage in landscapes the skies of which require blocking out for insertion of clouds. With an opaque mixture, even when used on the glass side of the negative, it is impossible to do justice to such subjects. A very simple solution of this difficulty is to block out on the film side with solution of a yellow dye applied with a medium-sized brush. Auramine, to be had from any large chemical house, is very suitable. The negative must be free from hypo, and the dry film is first gone over with wet, absorbent cotton, so as to cause the dye to diffuse slightly beyond the edge of the brush mark. In the case of subjects of very "fluffy" outline, work over the edge with a wash of weak dye, and then proceed as usual with a stronger wash, when odd bits which are not wanted to print can be taken off without leaving a sharp edge. The yellow dye is quite "opaque" enough for development papers, though perhaps not obstructive enough for all print-out papers. A very weak bath of hydrochloric acid will remove all the dye, if this is desired.

Stripping Films from Cracked Negatives

If the glass only of the negative has cracked, leaving the film intact, it is not a difficult matter to transfer the film to a new glass support, using for this purpose a mixture of: Denatured alcohol, 25 ozs.; water, 1 oz.; glycerine, 1 oz. To each ounce of this stock mixture required for the negative in hand, a few drops of commercial hydro-

fluoric acid are added at the time of use. The acid mixture must be made in a paper or ebonite cup, as the acid attacks glass. The film of the negative is cut through to the glass about ⅛ inch from the edge, the negative then leveled on three wooden wedges, and the acid mixture spread over it with an end of paper. In a minute or two, the edgings of film will be loose; they should come away with the slightest pull. The film itself is probably ready to come away, too, but may be tested by running a waxed silk thread (stretched on a cane bow) underneath it. Any sticking of the thread shows that the film requires a little longer, or possibly slight further addition of acid to the mixture.

When it is free, pour some of the plain mixture of alcohol and glycerine (without acid) on the film, and apply a sheet of "waxed paper," that is ordinary thin paper soaked in hot melted paraffin wax for half an hour, and kept under slight pressure. Squeegee this sheet down on the film, and remove the two together by slipping the point of a penknife under one corner of the film. The film can now be laid down on its new glass, which is prepared to receive it simply by flowing it over with very weak gum solution, drying and then flowing on some of the plain alcohol and glycerine mixture. The film, adhering to the waxed paper, is applied to this prepared glass, and the squeegee run over the waxed paper. The latter is then removed by one corner, using the blade of a penknife to keep the film on the glass. This stripping process is really a very quick and easy operation, formidable as it looks in print. It does not enlarge or distort the negative, and actually calls for no special dexterity in manipulation.

Broken Negatives

A negative that is broken into pieces is a more ticklish job, and one that usually requires some skilful retouching to make it worth while. The best thing is to cement the pieces, glass side down, on a plain glass with Canada balsam, taking care to avoid air bubbles between the two glass surfaces, and to secure a film of balsam between the various broken pieces. Then warm the glasses slightly and, when cool, remove surplus balsam with a little turpentine on a rag. After a day or

two has elapsed for the balsam to harden, the damaged edges may be touched up with color as far as is practicable, but usually a positive transparency must be made, worked up with the retouching pencil, and from that a second negative made, which also can be further retouched. The method is fully detailed in THE PHOTO-MINIATURE: No. 126.

Simple Retouching

Our catalogue of ills for which there are reasonably efficient specifics is now fairly complete. In this monograph I have not attempted to deal with defects for which there is no more or less adequate remedying process. They were considered in a quite early number of THE PHOTO-MINIATURE, No. 32, 1901, which I may perhaps revise in the light of later knowledge. The present monograph, however, may fitly close with a few hints on what is a very vital method of remedying a negative, viz., retouching with pencil on the film.

I cannot cover the field fully, and do not need to do so, since a recent issue (No. 122) on "How to Retouch Negatives" is still obtainable. But what I may do is to set forth the elements of the subject in a way which will encourage the beginner to take it up, and dissuade him or her from thinking it beyond the power of the amateur worker to acquire to any useful purpose. It is quite true that bad retouching is worse than none at all, but much retouching is bad simply because it is carried to excess, as it is by many professionals. Used with moderation, retouching, as it can be acquired with a little practice, is a valuable means of remedying the essential defects of the photographic process in the way of evening up false or too-marked rendering of the texture of the subject. While it is of service chiefly to the portraitist, it is of value in dealing with negatives of many other subjects, particularly such things as machinery and articles of art or manufacture.

The Retouching Desk

A prime essential is a support for the negative, allowing of comfortable working,—that is to say, a desk which is of width to accommodate the elbows and as high as the top of the head. The negative is held in a kit (*anglice*, carrier) mounted centrally in the desk.

White blotting-paper is used to reflect daylight through it; or a mirror, if a poor light, or the density of the negative calls for it.

Retouching Pencils

Pencils of various degrees of hardness are supplied by the dealers, Nos. 2, 3, and 4 being a useful selection. The softer lead (No. 2) is used when a heavier amount of penciling requires to be put on; but the beginner will find it best to content himself at first with a moderate amount of work, and to use the harder No. 3 pencil, with which it is easier to apply light markings. The lead should have a long, taper point (about ¾ inch beyond the end of the holder), obtained by rubbing gently on fine glass paper or emery cloth and finishing on hard drawing paper.

Preparing the Negative

The surface of the film is prepared to "take" lead by rubbing a very little of a good retouching medium on the part of the negative, using a light circular movement of the finger and softening off the application at the edges of the patch. As soon as the treated surface is free from stickiness, it is ready for work with the pencil.

Using the Pencil

Textbooks are apt to confuse the beginner by laying stress on this or that "touch" or form of the separate pencil marks. But begin by studying to avoid a definite heavy line, and you will be on the right path. The chief thing is to use the pencil very lightly. It may be a slow method, but you are not judging your work by its speed, as the professional retoucher in part has to do. As regards the form of the pencil strokes, small defects like freckles are well dealt with by a succession of tiny curves, something like a comma without any dot at the top. In a portrait, these markings are first evened out, and the pencil next used on hard lines and shadows in the face, in which, as a rule the pencil marks should follow the direction of the lines. Next comes the working-up of shadows caused by hollows in the neck and cheeks, for which a series of circles is generally most effective. Avoid cutting one set of lines by another running in another direction, which is a defect of much

crude retouching. And, finally, remember always that too light a stroke is better than too heavy an one. You can add to the one, but you cannot take away from the other without clearing off the retouching medium (with soft rag moistened with turpentine) and starting afresh.

BOOKS

How to Retouch Portrait Negatives (THE PHOTO-MINIATURE: No. 122). Illustrated, 25 cents.

Working Backgrounds into Portrait Negatives. The use of Etching Knives. Repairing a Broken Negative, etc. (THE PHOTO-MINIATURE: No. 126). Illustrated, 25 cents.

Notes and Comment

An exhibition of unusual interest, recently held in London, comprised a collection of pictorial work by amateur photographers of Japan. Judging from the reproductions published in our always attractive contemporary, "The Amateur Photographer" of London, the pictorialists of Japan are in no way behind their European co-workers. The processes represented in the exhibition are carbon, gum, bromoil, bromide, gaslight and plain silver printing.

Another very interesting collection which found its way to London, and is now being shown at the Camera Club, comprises a number of pictorial photographs by members of the Netherlands Photographic Club of Amsterdam. According to an account given by Mr. Antony Guest in "The Amateur Photographer," this collection is remarkable for boldness and originality of conception and cleverness of technique, apart from the high pictorial standard attained in most of the prints.

It is announced that "Photograms of the Year 1915" will be published in London before Christmas. The book should, therefore, be ready for delivery in America before the end of the year. We hope that this is possible. The number of pictorial workers looking forward to "Photograms of the Year," as practically the only means of seeing the best work of the year, shows a steady increase, and the American edition of "Photograms of the Year 1914" was much larger than for any preceding year.

As the American edition of the forthcoming volume

"Photograms of the Year 1915" is limited, those who desire copies should place their order with their dealer or with the American publishers, Tennant and Ward, New York, with as little delay as possible.

The book is identical in size and general style with last year's volume, comprising accounts of the progress of pictorial photography in different countries by expert workers who are acquainted with the facts, and about one hundred full-page and half-page reproductions of selected examples of pictorial work, chosen from some six or seven hundred prints sent in to the editor. The price of the book is, paper covers, $1.25; cloth-bound library edition, $1.75, postpaid.

"The British Journal Almanac, 1916," is to be published about the end of next January, and should be here in February. As a special feature, the new volume will offer "A General Review of the Resources of the British and Allied Nations in Photographic Manufacture and Trade." The American agent is George Murphy, Inc., 57 East 9th Street, New York.

A novelty which will appeal to those who use the carbon printing process is white carbon tissue, introduced by The Autotype Company, London (American agents, George Murphy, Inc., New York). Describing it the editor of "The British Journal" says: "A moment's consideration will show that a print upon this tissue from a negative will yield a negative image when the developed print is transferred to any support which is darker than itself. It cannot very well be transferred to anything lighter than itself, for it has a creamy white surface, which on any dark support appears to be a perfectly pure white. Thus the tissue requires to be printed from a positive, and the visible image, when transferred to a dark support, is then also a positive, but one differing fundamentally from any ordinary positive print. The heaviest deposit of pigment forms the highlights of the subject, while the shadows are formed by the dark support upon which

there is no white deposit. To put it another way, the white image acts toward the dark support as a graduated stencil, the portions of it representing the highest lights cover the support entirely; the shadow portions leave the support uncovered, while parts representing the halftones permit of the support showing more or less through the white deposit." Such a tissue has many novel applications in photography and I suggest that the interested reader should give it his attention.

"Abridged Scientific Publications" is the title of a 76-page booklet issued by the Research Laboratory of the Eastman Kodak Company. It contains twenty-two abstracts of as many scientific papers, by Messrs. P. G. Nutting, C. E. K. Mees, Orin Tugman, L. A. Jones, and F. A. Elliott, of the staff of the Eastman Research Laboratory, covering the years 1913, 1914.

The titles of the abstracts are as follows: The Absorption of Light in Heterogeneous Media; The Physical Chemistry of Photographic Development; The Sensitometry of Process Plates; Calculation of Exposure; The Triple Projection Process of Color Photography; Brightness and Contrast in Optical Images; The Correction of Process Lenses for Light in the Extreme Violet; The Distribution of the Silver Grain in the Developed Image; A New Standard Light Source; Color Analyses of Two Component Mixtures; Photographic Resolving Power; Light Filters for Use in Photometry; The Color of Illuminants; Transmission and Reflection Photometer for Small Areas; Reflecting Power Standards; Axial Chromatic Aberration of the Human Eye; The Visibility of Radiation; Mixed Specular and Diffuse Reflection; The Sensitometry of Photographic Papers; The Physics of the Photographic Process.

The papers here abstracted have been published at length in various scientific journals, many of which are not accessible to the general public. Hence the abstracts will be warmly appreciated by those who desire to keep abreast of the progress made in photographic research. No price is given on the booklet,

but doubtless it can be obtained from the Eastman Kodak Co., Rochester, N. Y.

An historical survey of the beginnings and development of film photography, a much-neglected subject, appears in "Photography and Focus" for November 2. The article contains much interesting information, but is strangely lacking in dates.

According to a report in the public press, "The Eastman Kodak Company has declared an extra dividend of 12½ per cent on the company's common stock. This is the largest dividend ever declared by the company, and brings the total extra dividends of common stock of the company declared this year up to 50 per cent. Besides this, common stockholders will receive the regular dividend of 10 per cent for the year. This return of 60 per cent on common stock of the company exceeds by 10 per cent the dividends declared by the company on its common stock in any previous year. It is also stated that the directors of the company at their January meeting will probably declare a dividend or bonus of one million dollars, to be paid to the employees of the company in accordance with a bonus distribution scheme introduced some years ago.

Away back in 1909, Dr. H. D'Arcy Power, of Burlingame, Calif., outlined in "Camera Craft" for October of that year several methods which he had worked out for the modification of the tones of bromide prints, for the obtaining of color effects. Briefly, the methods showed how to convert the silver image at any desired part of a bromide print into contrasting tints, helpful as correcting the color contrasts of the subject.

In "The American Annual of Photography, 1909," Dr. Power supplemented his earlier methods by modifications which gave even larger control over the bromide print, both as regards the colors obtained and the control of the color contrasts.

In the forthcoming issue of "The American Annual of Photography, 1916," Dr. Power publishes the results of seven years' working along the lines indicated in his earlier papers. His article, entitled "Color in Pictorial Photography," is one which should win a large interest. After setting forth in detail the many difficulties in the way of reproducing, with the artists' colors, or any of the methods of color photography known, the colors in a natural scene as the eye sees them, the author states that, "In the making of a picture, there are four elements: (1) Line, i.e. outside or shape. (2) Tone, i.e. light and shade contrast, chiaroscuro-mass. (3) Color contrast, i.e. the contrast between the effect of warm and cold colors, and (4) Color harmony, i.e. the effects of color blended." Leaving the first two elements aside, their control being familiar to the artist photographer, Dr. Power goes on to show that the third and fourth elements may be effectually controlled by combining his earlier toning methods, mentioned above, with the use of pastel colors on a bromide print chemically toned in two tints. I have seen a set of three prints very effectually demonstrating the value of these methods. The first of these was a straight bromide enlargement, 7x10, from a portion of a quarter-plate negative, the subject being a woman dancing in the sunlight under a tree. The second print, chemically toned in two tints, shows the figure and the lighter portions of foreground and background in pink and modified yellow tints, the shadows and the darks and semi-darks of the original black bromide print being modified to a slate or gray-blue. In the third and finished print, the color of the figure is heightened to a rose-pink, the veil worn by the dancer takes on a faint blue tint, and the sunlight effects have been heightened and mellowed by the use of pastel; in short, the print is enhanced by the blending of the colors in pleasing harmony.

The increasing interest in home portraiture, both as a delightful hobby for the amateur as well as a profitable branch for the professional, brings me many requests

for suggestions as to a home-portrait outfit. Among the two or three available in the market, it is difficult to give preference to any one, as they differ in their make-up, and especially in portability and price. The Montauk Compact Home Portrait Equipment, announced on another page by G. Gennert, New York, is especially worthy of examination by those interested. It is a carefully designed and well-finished equipment, including all the little requirements needed in this particular branch of work. It is obtainable in three convenient sizes, and offers remarkable value for its cost. Apart from home portraiture this equipment will be found equally useful for general view work.

Right in line with the subject of this number comes the announcement of the Victor Intensifier from James H. Smith & Sons Co., 3535 Cottage Grove Avenue, Chicago, Ill. For the improvement of the slightly under-developed negative; for the building up of just that little additional density in the negative which will give the more perfect print, the Victor Intensifier is unapproachable in efficiency and convenience. It builds the density up equally in highlights and shadows, thus preserving the relative values, and its action is always under control. It works equally well with wet or dry negatives, and can be applied locally with a plug of absorbent cotton, where this is desirable. As it can be used repeatedly, it is a money-saver as well as a negative-saver. Your dealer has it, or can get it for you, in powdered or liquid form, as you may desire.

An interesting pamphlet, which incidentally demonstrates the utility of photography as a method of illustration, comes to my table from Mr. Wilfred H. Schoff, of Philadelphia. It is entitled "The Atlantic Intra-Coastal Waterway," and gives an account of the inland waterway, or series of canals, linking the natural bays and sounds along the Atlantic seaboard. The waterways thus described include the Florida canals running along the greater part of the length of Florida, navig-

able by vessels of light draft; St. Johns River to Beaufort, N. C., and thence to Hampton Roads, Va.; the Chesapeake and Delaware Canal, connecting with the Delaware River and the New Jersey Canal; Staten Island Sound and the Hudson River to Waterford, N. Y., connecting with the old Erie Canal, and so on to the Great Lakes by way of Lake Champlain to the St. Lawrence River in Canada. The New England waterway connects with New York City by means of Long Island Sound and extends to Boston Harbor, the total length of continuous navigation made possible by these canals and waterways running to over 10,000 miles. Copies of this booklet, now in its fourth edition, can be had on application to the Atlantic Deeper Waterways Association, Crozer Building, Philadelphia, Pa.

The dearth of books dealing with photo-chemistry brings me not a few inquiries about a serious or advanced textbook dealing with this subject. Apart from Townsend's "Chemistry for Photographers," 4th edition, 50 cents, which is an elementary handbook covering the ordinary photographic processes, the only advanced textbook on the subject is Sheppard's "Photo Chemistry," price $3.50 net, postage 12 cents. This work includes considerable theory, being intended as a textbook for college students, rather than for practical everyday use by the photographer. This is indicated by its contents, as follows: Historical; The Measurement of Light-Quantities; The Energetics of Radiation; Economic and Energetic Relations of Actual Light-Sources; The Absorption of Light; Statics and Kinetics of Photo-chemical Change; Dynamics of Photo-chemical Change; Special Photo-chemistry; Radiant Matter and Photo-chemical Change; The Genesis of Light in Chemical Change; Organic Photo-synthesis; Index.

"Annuario 1915 della Fotografia," 7th year. Published by Il Corriere Fotographico, Milan, Italy. This

useful yearbook comes to our table somewhat late, but will be welcomed by Italian readers as comprising a mass of interesting information within a small compass. Its 449 pages comprise the usual calendar, many papers on photographic topics, and a collection of formulas and tables practically covering all branches of photography. The useful review of the photographic industry during 1914 concludes the volume.

Photographic Bargain List No. 19 received from the New York Camera Exchange, 109 Fulton Street, New York, is a 32-page booklet listing about 800 offerings of cameras, lenses and outfits, new and old, at about half the original or list prices asked for them. The bargain-hunter should not miss this list.

The record made by the Bausch & Lomb Optical Co., Rochester, N. Y., at the Panama-Pacific Exposition, is probably unequaled by any other exhibitor. The awards granted this firm for their different classes of exhibits aggregate four Grand Prizes, or highest possible awards, one Medal of Honor and one Gold Medal. In each case the award was the highest prize granted in its class. The exhibits comprised Optical Instruments, Balopticons, Engineering Instruments, Range Finders, Photographic Lenses, Projection and Photomicrographic Apparatus.

The Sixtieth Annual Exhibition of the Royal Photographic Society of Great Britain was held this year at the Suffolk Street Galleries, London, August 23 to October 2. Despite the interference of the Great War, the exhibition seems to have fully equaled those of past years in quality and variety of interest.

An unusual number of exhibits from American workers found acceptance this year. In the Pictorial Section, I note among the exhibitors, Pirie MacDonald, Karl Struss, Edward R. Dickson, Clarence H. White, Ottile é Amend, Miss Alice Choate, Arthur D. Chap-

man, Mrs. Adelaide Erich, F. Burthel Tanner, and Paul B. Warner, of New York. Special mention should be made to three portraits by Mr. Alvin Langdon Coburn, who, although at present residing in London, belongs, as most of us know, to America.

In the scientific section were shown some remarkable photographs from the Mt. Wilson Solar Observatory, Pasadena, Cal.; Prof. A. E. Douglas, University of Arizona; S. A. Mitchell; Leander McCormick Observatory, University of Virginia; W. F. Rigge, S. J., Creighton University; Edward C. Pickering, Harvard Observatory; Research Laboratory, Eastman Kodak Co., Rochester; Arthur L. Day, Geographical Laboratory, Washington; Dr. C. E. Kenneth Mees and L. A. Jones and P. G. Nutting, Research Laboratory, Eastman Kodak Company, Rochester, N. Y.; Bureau of Entomology, U. S. Dept. of Agriculture; and Louis Schmidt, Rockefeller Institute, New York City.

Among the color transparencies were a dozen autochromes of medical subjects by H. W. Morris, University of Minnesota. In this section, an autochrome landscape by J. Walton Lee was awarded one of the three medals given this year; the other two medals going to Mr. E. A. Pinchin for high power photomicrographs of diatoms, and Dr. Hugh Main for a remarkable collection of photographs showing the metamorphosis of a dor beetle.

Of the 172 exhibits in the pictorial department, the printing process employed is indicated in 100 exhibits. It is interesting to note from the record as to this detail that the use of bromide paper for enlargements and contact prints far exceeds the use of any other paper. Thus, of the 100 prints indicated, 62 are described as bromide prints, the nearest rivals being platinum with 12 prints, and bromoil with 9 prints.

Sadakichi Hartmann, who contributed the monograph on Home Portraiture in THE PHOTO-MINIATURE: No. 141, writing over his pen name "Sidney Allan, has a series of very helpful papers on Composition in the little magazine "Kodakery," published by the

Eastman Kodak Company, and an equally useful series for the professional photographer, on "The Features of the Human Face," in the other little magazine "Portrait," published by the Ansco Company.

Referring to the recent suit brought by the U. S. Government against the Eastman Kodak Company for breach of the Anti-Trust Law, in which the U. S. District Court at Buffalo gave its decision in favor of the U. S. Government, the editor of "Photography" tells us that "The proceedings revealed the fact that the Eastman organization controlled 72 per cent of the business in photographic materials in the United States. They also showed, in quite an overwhelming manner, the extent to which modern amateur photography has been the creation of Mr. George Eastman. He it was who first realized the possibilities of photography by unskilled amateurs or novices (including children), who know nothing about photography, and do not want to know anything about it, but practise it merely to the extent of pointing the camera and pressing the button, leaving all the work of development, printing, etc., to be done by others skilled in the art."

Clonnimes, Ireland
Mr. Hancock

Tintern Abbey, Co. Wexford, Ireland
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All About Enlarging

If I were asked what is the most marked change which has come over photography in the past five years, I should reply, the gradual arrival of the real pocket camera. Just as the cumbrous stand camera has been ousted by the convenient hand instrument, so the larger patterns of the latter have suffered a reverse at the hands of apparatus of ultra portability. The manufacturer has done his part well. He has made it possible for us to carry a camera which is as little an encumbrance as a cigarette case, and yet calls for little or no sacrifice in the size and quality of results. This modern development has involved another, viz., the substitution, to a very large degree, of enlarging for printing; for which change the manufacturer again has smoothed the way. Perfect as are the pictures obtained with vest-pocket and similar small cameras, they reach their proper effect only when enlarged. The results then are fully equal to those made direct with apparatus weighing pounds, as against ounces with the bijou camera, insomuch that the professional photographer has taken to the small camera as a means of saving him the cost of large plates or films.

Moreover, the enlarging process itself opens out a new field of fascinating work. It may be as simple and direct as contact-printing, or may be elaborated to yield effects which are hardly obtained by printing. In this number of The Photo-Miniature, my aim is to help the reader to make choice among a diversity

of methods, and at the same time to provide a working guide to the making of enlargements. In doing this, I am concerned chiefly with the apparatus which one can get from the photographic store. Their variety covers the most different requirements, though it may puzzle the beginner to know which will suit him best. Most of these enlarging boxes, lanterns and cameras serve equally well for bromide and gaslight papers; but in what follows I shall deal with them in respect to their use with the altogether more convenient gaslight paper. Where it is possible to use this class of paper, there is much to be gained, not only in the quality of the result, but in the comfort of working.

What is "enlargement?" At the outset, let me say a word in explanation of what is meant by "enlargement" of so much: it will save repeated notes on the point later. The degree of enlargement is always understood to be linear: that is, it is 2 if a 1-inch line becomes 2 inches in the enlargement; 3, if it becomes 3 inches, and so on. This way of considering enlargement is the one to be used in any calculations of the distance from lens to negative, or lens to sensitive paper, to which I will refer in a moment. It is only when the calculation of exposure for different degrees of enlargement is to be made that the respective *areas* of the enlargements are taken into account.

Degrees of Enlargement In considering what can be done in the way of enlarging, it is this degree of (linear) enlargement which matters; not the actual size of the enlargement. A fair average degree of enlargement is 4; e.g., a 12 x 15 picture from a 3¼ x 4¼ negative. Roughly speaking, any reasonably good negative will stand enlargement to this extent without noticeable unsharpness or fuzziness resulting. But a much greater degree of enlargement can be used, say 8, 10 or even 15 times, with very satisfactory results, according to the sharpness of definition in the original negative or, on the other hand, the degree of fuzziness or softness of definition which one will tolerate in the picture. Often the result of great enlargement is surprisingly good. I remember once taking part, with other members of a club, in an

endeavor to imitate some of the freak "fuzzytypes" of the early days of pictorial photography. I sent small pieces of negatives measuring about 1 x 2 inches to a trade enlarger, ordering him to make 10×20 ($=10$ times) enlargements. I thought to get distressingly unsharp prints, instead of which the pictures possessed an admirable quality—certainly somewhat diffused, but with nothing approaching an unpleasantly bizarre effect. Still, taking hand-camera negatives all in all, it is not a bad rule to adopt four times as a fair degree of enlargement, and eight to ten times as a degree for more occasional use; that is, when the negative is exceptionally sharp or when one's aim is more "impressionistic, as in pictorial photography."

Distances in Enlarging

Now for one further little bit of arithmetic, and I can promise the reader that throughout the rest of this monograph I shall not need to stray from the strict path of practical work. In the making of an enlargement to any particular degree, the distances of the negative and the sensitive paper respectively from the lens follow a definite rule. These distances depend solely on the focal length of the lens and the degree of enlargement. Take, first, the distance from lens to paper. This is always equal to the focal length of the lens *multiplied* by the degree of enlargement *plus* one focal length. With a 6-inch lens and 4-times enlargement it is $6 \times 4 + 6 = 30$ inches. The distance from the negative to the lens, on the other hand, is equal to the focal length of the lens *divided* by the degree of enlargement, *plus* one focal length. In the example just cited it is: $4 \div 6 + 6 = 6\frac{2}{3}$ inches. Nothing very difficult about that; but the rule can be made still easier to remember by imagining a bar projecting at either side of the lens to the distance of one focal length. Then the further distance to the paper will be as many focal lengths as the times of enlargement, whilst the extra distance toward the negative will be only the fraction represented by the focal length divided by the degree of enlargement. The reader will notice that the distance from the lens to the negative will always be greater than one focal length, but never

greater than two focal lengths; and that, the greater the degree of enlargement, the smaller the distance from negative to lens. As we shall see directly, one very handy method of enlarging is to use one's own camera, putting the negative in the place of the focusing screen. In these circumstances, as the above rule shows, the camera requires to extend to one and one-half times the focal length of the lens, in order to permit of a two times enlargement. If the extension is less than this, the camera will serve only for greater degrees of enlargement, but can be easily modified, as we shall see, for the smaller degrees of enlargement which sometimes are called for. In other words, a camera of very limited range of extension, such as many of the compact folding instruments now in general use, serves perfectly for use in enlarging say, four times, and over, but as will be seen later, requires to be adapted for enlarging upon a more moderate scale.

Methods of Enlarging

So much for what I may call the bare bones of enlarging. I have dealt with them at the outset, because they apply to any system of enlarging with a lens which may be followed. Now let us consider what choice of working methods is open to us in making pictures from our small negatives. Broadly, three systems are available: (1) To enlarge on gaslight paper (D. O. P.); (2) to enlarge on bromide paper; and (3) to make an enlarged negative from which to print large-size contact prints on any paper whatever, whether development, print-out, platinum, or carbon paper. This range covers all existing facilities for enlarging with the exception of enlarging direct onto platinum paper. This, however, is a method calling for enormous power of light, on account of the comparatively low sensitiveness of the paper, and is used only by makers of platinum enlargements on a commercial scale, and even by them only when a single enlarged platinum print is required from a negative. Given a sufficiently powerful illuminant, however, such as the new Cooper-Hewitt, enlargements on platinum paper are not difficult to make. In all enlarging, one's capacity for doing things depends upon the efficiency of the light.

Enlarging on Gaslight-Paper

Of these three methods, the use of gaslight paper is by far the most accessible to the amateur worker, besides being the one which best meets his special needs. It has certain limits, arising from the much lesser speed of the paper; but its drawbacks in this respect can be met in various ways. On the other hand, its positive advantages are many. By certain methods of working, it dispenses entirely with a darkroom: the paper is handled exactly as in making contact gaslight prints. That is so when we use any closed enlarging-box which protects the paper fully during exposure, that is, presents it only to the light coming through the lens. But even when using methods according to which the paper is pinned to an easel, to receive the enlarged image, gaslight papers call only for a darkened room, instead of one made absolutely dark, as is necessary for bromide enlarging. This alone is a facility which counts for a good deal with the majority of amateur workers. But still more to the advantage of the amateur is the power which gaslight paper confers of making first-class enlargements from all classes of negatives. The range of sensitive material, i.e., the variety in different grades of paper, is so much greater. In the language of a leading maker of gaslight paper: "there is a paper for every sort of negative." With bromide, we must dodge unsuitable negatives in development, or tinker with the negative by way of intensification or reduction; with gaslight, we make good any deficiency of the negative by choosing a suitable paper for it. In illustration whereof, I will mention a case which came before my notice some little while ago. A traveler passing through London handed out a batch of negatives for enlargments, to match some previously made from the same films in New York. Although the work was done by a leading firm of enlargers, the results were pitiably poor and flat in comparison with the New York pictures. I happen to know that the English firm made all the use it could of bromide paper; the American enlarger used "gaslight." European workers, on the whole, have been slow to appreciate the value of the slower grade of paper for enlarging, doubtless from an imagined

dread of excessively long exposures. True, exposures *are* considerably longer, but, as we shall see, not impractically so. On the other hand, the greatly superior quality of the pictures more than compensates for the extra time required for "gaslight." And when the conditions do prohibit the use of "gaslight paper," precisely the same apparatus then serves for the making of bromide enlargements.

The Negative

In the text-books you will find the stereotyped instruction that the negative for enlarging must be thin or soft. It is a piece of advice which, like many another, in human as in technical affairs, disregards hard facts. Unfortunately for its universal adoption, it is the picture on the negative which prompts us to make an enlargement—not the particular technical quality which we happen to have secured in our film. Moreover, in point of fact, a negative nowadays may almost as often be too soft for a perfect bromide enlargement as too hard. The general use of gaslight paper for contact printing, coupled with methods of time development, has led to negatives being thinner and softer than formerly. It is true that the mere fact of printing by projection, instead of by contact, leads to somewhat greater contrast, for the reason that the enlarging process permits the light scattered by the particles of the negative to escape, whereas, in contact printing there is no opportunity for this loss by scattering to take place. But the difference due to this factor is small; insignificant in comparison with the differences among negatives. To continue to suggest, as many text-books do, that a negative can hardly be too soft for enlarging, is only to lead the unhappy beginner astray and to discourage him in his hobby. With gaslight papers, any negative is suitable for enlarging, with the exception of those of great density or suffering from yellow stain. Of these two classes, the former will yield to extra power of light, and the latter to an anti-stain solution. Usually, however, a negative which is dense is also contrasty, and is therefore better enlarged onto bromide paper, if necessary with special means for the reduction of contrast described in a later paragraph on page 607.

Negatives and Papers

Speed and contrast are the two chief features of a gaslight paper as regards enlarging from different classes of negatives. Surface, tint and weight of paper are matters of taste; but I recommend the beginner to use, at first, a white paper of fine surface (matt or velvet) and normal (not double) weight. In the matters of prime importance there is abundant choice among the many brands of gaslight, practically every maker issuing three (and some four) grades. It is impossible to classify all these various papers exactly; but I can guide the beginner usefully in making a choice by singling out one or two papers, belonging to each class.

Slow-Hard Papers.

These papers correspond more or less with the original "Regular" grade of Velox (the first gaslight paper), now issued as "Vigorous." With the exception of one or two exceptionally slow papers, they have the least sensitiveness of any grade; but they yield prints of great snap and brilliancy and, therefore, are suited for very thin and flat negatives, such as produce dull, muddy enlargements on bromide paper. In fact, they are not of much use for any but very thin negatives, and then in a daylight enlarger, owing to their slow speed. Makers' descriptions of these papers vary a good deal; one firm's "Normal" being much harder than another's "Contrast," which, again, may be as plucky in its working as another maker's "Hard." Contrast or Normal Cyko, and Vigorous Velox are examples. It is not worth while to mention others, for, as I have said, this is the least useful grade of paper.

Soft Papers

These are the most useful grades of gaslight paper for enlarging. Though described as "Soft," the contrast with them is much above that of bromide. Their speed is from three to six times that of the "Contrast" papers, but still such as to allow of handling in development without a dark-room. They are the papers for average thin negatives, with which they yield enlargements of fine, rich quality, cleaner in the lights and more vigorous in the shadows than those on bromide. By some makers these soft grades are designated "Special."

Extra-Rapid Papers.

There are one or two papers which come midway between gaslight and bromide. They are more akin to bromide papers in speed, but resemble gaslight papers in their more kindly treatment of negatives somewhat deficient in vigor. These are Enlarging Cyko, about six times the speed of soft Cyko; the new Enlarging Rexo and Brome Black, which are really of the speed of a slowish bromide paper and yield a very fine warm black or brown black tone with normal development. These are not gaslight papers in the sense that they can be handled or developed by gaslight,—they require a bright yellow light,—but they are valuable grades when one has to deal with negatives of extra density, or is compelled to use a low-power light, such as incandescent gas, in the enlarging lantern.

Extra-Slow Papers

Lastly there are papers of slower speed even than those of the "Contrast" grade, but of a *de luxe* type, which yield prints of a quality which marks them out from other materials. My experience of them has been confined to Professional Cyko, which is about five times slower than Soft Cyko, but is a paper apart in the soft yet brilliant results which it yields. It works well with the average plucky negative, and yet will give amazingly good prints from indifferent negatives. But, for a paper of this type, it is absolutely necessary to have ample illumination if the exposures in an enlarger are not to be impossibly long. You want a large-aperture lens, and, for artificial light, nothing of less power than an arc lamp, the Cooper-Hewitt M-shaped tube or the 250-watt nitro filled lamp, is of any real use.

Apparatus

Just what apparatus we should use for enlarging depends, first, on the range of work we propose to do, and, second, on the facilities we have at home. Choice also depends greatly on whether we have the opportunity to work during the hours of daylight, or are compelled to use artificial light. For enlarging on gaslight paper, daylight is much the best illuminant. Let me, therefore, consider first the different ways in which it can be utilized. In doing that, I shall confine myself to appli-

ances which the reader can buy from his dealer, or can readily adapt from other old apparatus which he may have or can buy at second hand for a trifle. I confess that my own enjoyment of enlarging does not extend to making the whole outfit. In that I know I am shamed by the greater versatility of workers such as Mr. James Thomson, who, in a previous number of THE PHOTO-MINIATURE (No. 123), has shown how to make many efficient and inexpensive enlargers of his own design. Yet I feel that, if I were tempted to be my own constructor, I should do a good deal more joinery than enlarging, and suffer in the latter for my clumsiness in the former.

For daylight enlarging, there are, in the main, three systems to be followed: (1) The enlarging-box at fixed or adjustable focus; (2) Using a darkened room as an enlarger; and (3) the daylight enlarging camera, or two cameras coupled together. Let us see which of these plans will best suit the reader, and why.

Fixed Focus Enlarger

This kind of enlarger is the simplest and cheapest you can have, yet, within its limits, capable of first-rate results. It is simply a closed box, either rigid or collapsible, with a frame at one end for holding the film or glass

FIG. 1.

negative, and at the other end a loose cover or lid holding the gaslight paper flat by means of clips, or by pressing it against a sheet of glass. The lens is mounted in a partition between the two, placed so that it forms (Fig. 1) an enlarged image of the negative on the paper. There is no focusing; you get an enlargement of the whole negative to a fixed degree, which is usually 2

times. Thus, from the Brownie Series of enlargers you may choose one for 6½ x 8½ enlargements from 3¼ x 4¼ negatives; 5 x 7 from 2¼ x 3¼; or 8 x 10 from 4 x 5. Smaller negatives can be used in the larger sizes, but the degree of enlargement remains the same. The box for vest-pocket (1⅝ x 2½) negatives gives a little greater degree of enlargement, enough to cover the 3¼ x 5½ postal card. With an enlarger of this kind, you have only to slip the negative in position, then, in a weak indoor light, to insert the paper, and you are ready to expose, simply by standing the box out-of-doors, pointing to a clear sky. The exposure will be fairly long, since these boxes are fitted with cheap small-aperture lenses, generally not more than *f*/16. With bright diffused daylight (never expose the enlarger in the sun), the time with a "soft" grade of gaslight paper will be 10 to 30 minutes. That is a rough idea; a word, later, on judging time of exposure.

Adjustable Enlarging Box

On the whole, the simple fixed-focus box is the handiest apparatus of its kind; its drawbacks being the one scale of enlargement and the slowness of the lens. To remove both of these defects at once, several makers of high-grade vest-pocket cameras make enlargers which are not complete in themselves, but are made to be used with the camera and lens used in taking the negative. The enlarger consists of a bellows body, the front of which carries the small camera, while the back is fitted with a light-tight holder for the paper. The negative is held in a frame, which may take the place of the small focussing screen or may be a separate piece. An enlarger of this type is made for the Goerz pocket camera of the Goerz Co., and for the "Sibyl" of Messrs. Newman and Guardia. With these, various degrees of enlargement up to 4 or 5 times can be got by setting the two parts to marked points. The "Graphic" enlarging camera of the Folmer and Schwing Co. provides a similar range. It is made to be set by actual focusing of the enlargement, and therefore serves for use with any small camera which can be fitted to the larger bellows body. The *f*/4.5 lens, such as many small cameras carry, when thus used for enlarging,

cuts down exposure more than ten times as compared with $f/16$, so that an average time is one to three minutes, apart from the advantage of extra enlargement. Yet, on the whole, the simple enlarging-box serves the purpose best. For gaslight paper even, the non-focusing enlarging-box, with adjustment for enlargement up to three or four times, is not worth while, on account of the length of exposure; though convenient enough for the more rapid bromide paper.

Room as Enlarging Camera

Whenever a room, however small, can be spared, there is no better method for daylight enlarging than to use it as part of a big camera. No need to keep it for this sole purpose; only the window requires to be blocked up, so as to leave a space about the size of the largest negative to be enlarged. The negative is mounted in this opening by means of a frame, fitted with a set of kits (carriers) for various sizes. Against it, within the room, is placed a camera with the focusing screen or spool back removed. The camera used in the making of the negative will very often answer, but it requires to have a front-focusing movement, allowing an extension of at least 1½ times the focal length of the lens, and a focusing adjustment of about one third of the focal length. If your own camera is not adaptable by reason of its shape or short extension, you can need nothing better than one of the bygone field cameras of heavy pattern, such as are now offered in lists of second-hand apparatus for a dollar or two. The heavier it is and the fewer movements to it, the better for our purpose, so long as it is firm and has a smooth focusing movement. The only other part of the outfit is an upright easel, to carry the sensitive paper, and a long board or base along which the easel or upright-board can be moved, whilst kept, by means of a guide strip, at right angles to the line coming straight through the lens. There you have the equipment in outline. The actual fitting-up will not tax the least handy person. In THE PHOTO-MINIATURE: No. 100 (now out of print, but possibly obtainable from some dealers), Mr. Zimmerman describes a very practical room equipment of this sort.

Darkening the Room

To block up the window all but the space required for the negative, make or get made a frame to fit the window-frame (Fig. 2). It need not be more that 2½ inches wide by ½-inch thick. On the side which is to face outdoors, tack a strip of coarse carpet-felt all around, and slightly projecting over the edges, to make a light-tight junction with the window-frame. On the other side (facing indoors) nail a couple of cross bars (*ab* and *cd*), one, say, 3 inches above the lower edge, and the other 3 inches more above it than the long side of the negative. Then cover the frame, by tacking or gluing, with any thin dark mounting board, and cut out an aperture between the two cross-bars an inch or so larger, all the way around, than your negative. The frame will pretty nearly hold itself in place; at any rate, will not want more than a pair of wooden wedges to make it secure. For gaslight paper, it is really not necessary to block up any other window in the room so completely as just described; sufficient, to cover with a dark blind or curtain, so long as no direct light from chinks falls on the paper during exposure on the easel.

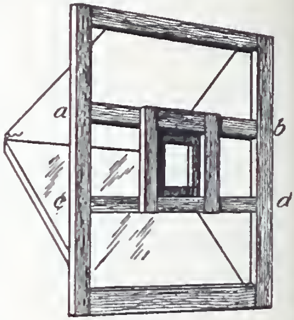


Fig. 2.

Joining Camera to Window

Now for the only bit of real joinery (carpentry) in the job. We want to provide a frame to hold the negative, and at the same time make a light-tight connection between window-screen and camera. For the negative holder, get kits of the size sold for using a plate of your size in a plate-holder of two sizes larger. For example: If your negative, either film or plate, is 4 x 5, get an 8 x 10 kit (to take 5 x 7) and a 5 x 7 (to take 4 x 5.) Fix the 8 x 10 kit to the two cross-bars (on the inside). The bars, as already directed, should be 3 inches wider apart than the long way of the

negative; i.e., 8 inches for 4 x 5, which allows you an inch at each end to secure the 8 x 10 kit to the 2-inch bars. The reason for ample space around the negative is to avoid uneven illumination near the edges due to nearby framework cutting off light. The plate kits are cheap to buy, and can be fitted with turn-buttons, to hold the glass negative in place. A film negative is placed between a pair of extra-thin glass plates.

In fitting the camera to the negative, the method is

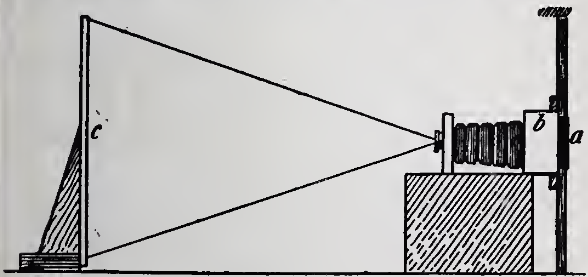


FIG. 3.

to provide (*b* Fig. 3) an open-ended extension-box to or into which the camera is attached, the other end being received by a shallow frame on the window-screen, (as shown in Fig. 2). Just how this fitting must be done depends on the type of camera. With a field camera, the best thing is to make a frame to take the place of the reversing back, and to screw four side-pieces to it, to form the endless box. Many oblong plate cameras of the Premo type can have the frame to fit over them, and the same plan can be followed with roll-film cameras, removing the back cover and providing the frame with a velvet sleeve, to cover any leakage of light around the winding keys. The junction of the other end of the box with the window-screen is made by screening or gluing 4 narrow strips of about ½-inch thickness either to the cross-bars or to the negative kit, fixing them so that the extension-box just pushes in. All inside woodwork should be dead-blacked. As regards the depth of the box, that depends on the extension of the camera, and requires to be

can select part only of the negative. Soften the definition by putting the enlargement a little out of focus; use other means of diffusing definition, shade any parts of the paper and print in clouds, all of which are big items in making fine enlargements. And the cost of the outfit is a fraction of that of a complete lantern or camera affording similar facilities. Moreover, a special gain is the ability to use a large-aperture lens of *f*/6 or *f*/4.5, thus greatly reducing the time of exposure. In using an enlarger of this pattern it is a good plan to mark the baseboard in focal lengths, e.g., a bold line every six inches (for a six-inch lens), reckoning from the negative. This is a useful guide to placing the easel in the right place at the start, when enlarging to any degree. For the rule is that the paper must be placed at a distance from the negative equal to three more focal lengths than the degree of enlargement e.g., seven focal lengths for a four-times enlargement. Strictly speaking, it is a fraction of a focal length more than this; but the rule places the easel within an inch or two. Then, with the easel so placed, and the negative in the carrier, the next thing is to focus.

Focusing

Use a sheet of stout, smooth matt paper, (Bristol-board), pinned evenly to the easel, for focusing on, and, with the lens at full opening, move the focusing pinion one way or the other until the large negative looks as sharp as you can make it. Carefully compare the definition of the image at the center with that at the margins. If one is noticeably sharper than the other, the cause is probably want of covering power in the lens. Stop it down to the next smaller aperture. If the lens is an anastigmat, of focus about equal to the *long side* of the plate, it ought to cover fully at its widest aperture, or at any rate at *f*/6 if it is an *f*/4.5 lens. A rapid rectilinear lens should cover at *f*/8. In making this test, really with the object of finding once and for all the largest stop which can be used, it is well to use an old, thin negative, with fine, clean knife-cuts through the film to the glass each way across it, about one-fourth inch apart. It is placed in the negative-holder, and will show up any want of definition very distinctly.

Having found which stop may be used, focus with the negative in place and operate the pinion, so as first to pass quickly from unsharpness to sharpness, and then to unsharpness again, all with one forward or backward movement of the lens. Then do the same thing in the other direction, but not so far beyond the sharpness stage. By thus boldly racking back and forth a few times over the sharpness point, but lessening the movement each time, you will get sharp focus better and more quickly than by minute adjustments of the pinion on no particular plan.

Focusing being completed, the lens should be capped with a yellow glass cap, and we are ready for exposure. The gaslight paper is pinned in place and exposure given. With a "soft" paper (see p. 573) an average time, in bright diffused summer light with $f/6$ lens and four-times enlargement, will be from 2½ to 8 minutes: for eight-times enlargement, 10 to 30 minutes, but see the paragraph later on about judging exposure.

Vertical Enlarger

For those who have a small skylight in a room, or, better still, forming the top of a cupboard, a most convenient arrangement of an enlarging room is to let the light come straight down through negative and lens to the paper. For this, the skylight needs to be blocked up, all but a clear space about two inches all round larger than the negative, and a stout shelf (to carry the negative laid upon it, and the camera fixed to the under side) fixed just below it. The shelf, of course, has an aperture in it a shade smaller than the negative, and is connected to the open space in the skylight shutter by a bellows, the lower end of which is provided with a stout wood frame, forming a light-tight junction on the shelf, so that a negative can be quickly placed in position by raising the bellows. Often the whole arrangement can be left in place without inconvenience, and the enlarger made complete by placing the easel at the required distance below the lens by laying it flat on a table and raising it as necessary by blocks or boxes. A cupboard is much easier to adapt on these lines, since it is easy to fit it with a goodly number of side supports for three shelves,—one for negative, one

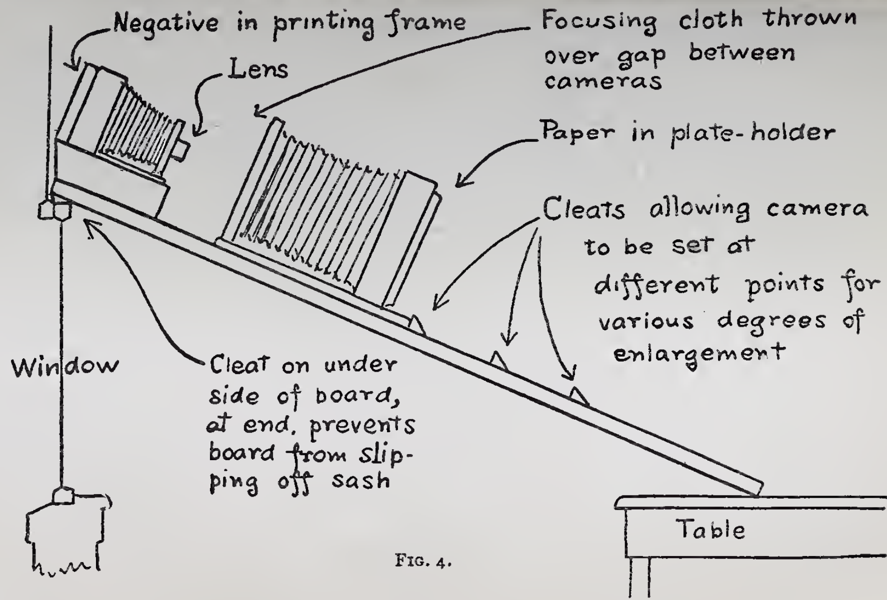
for lens, and one to serve as easel. The positions for the shelves are chosen for various degrees of enlargement, whilst exact focusing is done by fitting the lens to a rack-and-pinion mount, such as that of an old portrait lens. In whatever form this vertical enlarger is used, it affords the great advantage of small working space, insomuch that the apparatus can be kept set up ready for use at a moment's notice. Moreover, the direct sky illumination of the negative is stronger, and usually does not require to be diffused.

Daylight Enlarging Cameras

My third system of working is a daylight one also, in the sense that the apparatus is handled in full daylight, like a fixed-focus enlarging-box but, unlike the latter, the enlarged image is focused on a ground-glass screen, and any degree of enlargement over a wide range can be obtained. Excellent apparatus of this type are the Soldak of G. Gennert and the F. & S. Graflex and Crown enlarging cameras of the Eastman Kodak Co. He or she whose pocket does not run to the $35 to $60 which such cameras cost in the 8 x 10 size may easily use almost any focusing camera in conjunction with an old square-bellows pattern camera of, say, 8 x 10 size. The only adaptation of one's own small camera is to remove the focusing screen and to place a printing-frame against it as a holder of the negative. No better description of the outfit is needed than the diagram (Fig. 4) from a recent number of "Camera Craft" accompanying Mr. Charles F. Rice's advocacy of this type of enlarger. For the straightforward making of enlargements of only moderate size, it is a first rate plan. But don't confuse size of the enlargement with degree of enlargement, for, as Mr. Rice points out, his home-rigged outfit, which cost him $16, will enlarge up to twelve times, which is more than enough for ninety-nine negatives out of the average hundred.

Exposure in Daylight Enlarging

Thus far I have been content to give the reader an indication of the exposure required for "soft" gaslight paper under various conditions of enlarging. But, before passing to the use of artificial light, I ought



Negative in printing frame
Lens
Focusing cloth thrown over gap between cameras
Paper in plate-holder
Cleats allowing camera to be set at different points for various degrees of enlargement
Window
Cleat on under side of board, at end, prevents board from slipping off sash
Table

FIG. 4.

to mention the real use which can be made of an ordinary exposure-meter (one with a sensitive paper), such as the Watkins or Wynne, in testing the strength of daylight, and so overcoming the chief difficulty in giving a correct exposure. The simplest system of this kind is that devised for the Kodak Brownie enlarger. Here the working aperture of the lens is made such that the time required for a properly exposed enlargement on "soft" Velox is the same as for a contact print on Solio paper from the same negative. An actinometer of graded densities, each numbered, is provided with the enlarger. Some Solio paper is first exposed at the same time behind both the negative and the actinometer. That under the negative is exposed until dark enough for toning, when the printing under the actinometer is stopped. The negative is now placed in the enlarger, charged with the gaslight paper, and the Solio paper in the actinometer shifted to one side, so as to expose a fresh strip. Actinometer and enlarger are now placed in the light together until the fresh strip of Solio matches that first exposed. That is an excellent system, because it provides for any variation in the light during exposure; but it is not possible or convenient to use it in all daylight-enlarging, since the slower gaslight papers will not print in the time, whilst the more rapid kinds, or others when a lens of larger aperture is used, will print more quickly. In these wider conditions, an exposure meter serves as the best guide; though it still leaves one to judge the density of the negative as in contact printing. To use it, you must first find what is the best exposure for the paper when using a certain stop in the lens and when enlarging to a given degree. Choose the even, uniform light of midday for this, and make a note of the time required for the paper of the exposure meter to match its tint. Suppose it is twenty seconds, while the exposure for the gaslight paper (for a two-times enlargement) is three minutes, that is nine times the actinometer time. For the same negative, stop, and degree of enlargement, the exposure may fairly safely be taken as nine times, whatever the actinometer-time is found to be. For other negatives, you must multiply the time thus found as you judge

necessary according to the negative. A few careful experimental trials will bring facility.

Experience the Best Guide

I can prescribe no more certain guide than experience in "sizing up" a negative. For various degrees of enlargement however, there is a definite rule. Knowing the exposure for, say two times, that for other degrees is obtained by multiplying by a factor thus:

For a degree of enlargement of

$2\frac{1}{2}$	**3**	**$3\frac{1}{2}$**	**4**	**5**	**6**	**8**	**10**	**12 times,**

multiply the time of exposure at 2-times by

$1\frac{1}{4}$	**$1\frac{4}{5}$**	**$2\frac{1}{4}$**	**3**	**4**	**5**	**9**	**13**	**19.**

The same actual aperture in the lens must be used when enlarging to the other degree. It usually is, but, if it is not, the exposure is shortened or prolonged just as it is in ordinary photography, and separately from the increase due to enlarging upon a greater scale. All this I know must sound horribly formidable to the beginner, but I can offer him one other rule which will lighten the application of the others, and that is to tabulate notes of his exposures, recording actinometer-time, degree of enlargement, number of lens, and gaslight paper used, together with a memorandum of the negative which will allow of its being gotten out for comparison with any plate which may afterward be enlarged. These notes, or rather those of them starred as referring to successful results, will provide a basis from which you can figure out the time for any combination of conditions with very little trouble, and with reasonable assurance that it will be right.

Enlarging by Artificial Light

To the majority of workers, whether amateur or professional, the use of artificial light for enlarging appeals most strongly, as permitting the work to be done during leisure hours or on dull days, and also as giving freedom from the vagaries of daylight in the important detail of exposures. In one form or another, it is now possible to adapt artificial light to almost all the enlarging equipments available, from the simplest home-made or commercial fixed-focus enlarger to the most elaborate of enlarging cameras.

Four Principal Systems

We may profitably summarize the four principal systems for enlarging by artificial light. In all of them the aim is to provide an evenly distributed, uniform and powerful light area to illuminate the negative to be enlarged.

Condenser System

They are: (1) Systems using a "condenser," which is a pair or triplet of condensing lenses, the diameter of which is larger than the negative to be enlarged, placed between the negative and the illuminant used. This condenser gathers and concentrates the light passing it in the form of a cone through the negative, and thus transmitting through the enlarging lens a larger volume of illumination than is possible by any other light system with perhaps one exception. This is the system employed in most of the commercial forms of enlargers today, and is adaptable to almost any form of illuminant, though working at its best with a light source of small area, such as the Nernst or nitro-electric lamp or the electric arc.

Direct Light Without Condenser

(2) The up-to-the-minute system is one which employs direct light without the somewhat bothersome and expensive condenser, by providing a very large light area, usually screened through sheets of ground-glass or opal placed between the light and the negative. The Cooper-Hewitt M-shaped tube enlarging lamp is the most efficient of this class, where the volume of enlarging warrants its use. It gives an ideal enlarging light, evenly uniform throughout its area, without flicker or variation, and needing no attention in manipulation. The 8 x 10 lamp, with two ground-glass diffusing screens, gives exposures of from 3 to 12 seconds with a lens working *f*/6, and its efficiency is widely commended. Gray's Parallax Reflecting Condenser Lamp, using incandescent filament lamps, nitro and tungsten types, of varying power according to the size of the lamp, is another of this class. It is much favored by amateurs as offering remarkable efficiency at a low initial expense. The 9D. Parallax takes a 300-watt nitro or a 150-watt tungsten lamp,

and with a lens at $f/6$ gives exposures from 10 to 90 seconds for enlargements of two to four diameters.

Reflected Light Systems

(3) In this system, the lamps are placed at the sides or above and below the negative, the light falling on a curved white surface which reflects it in a diffused state through the negative. This can be used with incandescent gas but is most efficient when used with an ample number of electric lamps.

Direct and Reflected Light

(4) This is the system used in the illuminator introduced for the Brownie enlarging box and similar appliances, which can be fitted to the user's own camera. The lamps are placed directly behind the negative, are backed by a curved reflector, the rays from which pass, with those thrown forward by the lamps themselves, first through the diffusing screen and then through the negative. Within the scope of its field this system is practical and convenient. It is restricted to electric light, the mantles and fittings necessary for the used gas obstructing so much of the reflected light as to annul this part of the illumination.

Which System to Choose

Undoubtedly the user of gaslight papers, if he can afford it, or the volume of enlarging to be done will warrant it, will find the largest convenience and economy in the direct light enlarging equipment provided by the Cooper-Hewitt M-shaped tube outfit. The Parallax Reflecting Condenser Lamp comes next in efficiency and economy; after which come the various "condenser" enlarging lanterns or cameras, such-as the "Ingento" (Burke & James), the "Prize" (G. Gennert), the "Acme" (Acme Enlarging Lantern Co.), the model B Balopticon (Bausch & Lomb Optical Co.), or the Kodak Enlarger (Eastman Kodak Co). British workers have a wide range of choice among the enlarging lanterns of Butcher & Sons Ltd., Houghtons Ltd., and the Thornton-Pickard Mfg. Co. The main feature of all these lanterns is their efficient use of the light-source employed, and with many of these a variety of illuminants may be used at will by simple adaptations for the purpose. The systems described in classes 3 and

4 have the merit of unexpensiveness and are, generally speaking, adaptable for use either with the ordinary focusing camera or fixed-focus enlarging-box. They are very satisfactory for all work involving enlargements up to 3 or 4 diameters, but for work on a larger scale the length of exposure required is against their use.

The Enlarging Lantern

In the choice of an enlarging lantern using a condenser, one of the chief things to consider is the diameter of the condensing lenses. This should be a little more than the diagonal of the negatives which it is intended to enlarge from, e.g., 5½ inches for a 3¼ x 4¼ plate; 6½ inches for a 4 x 5 negative. As regards making the best use of the lantern, it is just as much a mistake to have the condenser too large as too small. If the diameter of the condenser is cut too fine, the negative is not illuminated to the corners, because there is always a certain (small) distance from condenser to negative. And, as the rays converge slightly in traversing this space, the condenser requires to be bigger than the bare diagonal of the plate in order to provide for it. But, on the other hand, a condenser which is much larger than the proper size brings the light to a point much farther forward, and requires a projecting lens of correspondingly longer focus, otherwise there is much loss of light. It is quite a mistake to buy a large-size enlarging lantern with the idea that it will do equally well for smaller negatives. Better choose for the size which forms the bulk of your work and let the others take their chance. Remember that you can always make a reduced negative from one which is too large for your enlarging apparatus.

Condensers

The glasses of the condensers should fit quite loosely in their metal or wooden cells, when cold: if they are a tight fit, there is danger of fracture when the apparatus gets heated in use. The proper position of the glasses is with the flat surfaces outside, the two convex surfaces facing each other within the cell. See that the condensers are clean and free from dust: smeared or dirty glasses lead to loss of light.

Enlarging Lantern Movements

Although a whole series of different movements is now provided by makers of enlarging lanterns, they are not all essential or even desirable. The two essential movements are a really smooth motion by rack and pinion, or otherwise, of the front board which carries the lens, and sufficient movement of the light to and fro behind the condenser. In some enlargers the focusing rack and pinion is such poor stuff that it soon wears loose and gives a jerky movement of the enlargement on the easel, which makes proper focusing difficult. The chain-and-sprocket motion adopted by some makers here and abroad, gives a very smooth adjustment. The light must be capable of moving (either in or with the "house" in which it is placed) about twice the focus of the condensers, i.e., about ten inches for six and one-half-inch condenser or fourteen inches for a nine-inch. This is necessary for securing even illumination at different degrees of enlargement. When the light is a small one, such as an arc, the range can be about half, if the light is of bigger area or diffused through ground glass.

In many lanterns, the negative holder is made to provide three separate movements, viz., rotating, rise or fall, and tilting. The first is simply a convenience to save one the trouble of placing the paper askew on the easel if the subject happens to be not "square on the negative." The rise-and-fall is a movement which can easily be misused. If employed by the lazy worker also to save him the trouble of pinning up the paper again, if he happens to fix it too high or too low, it will probably spoil the illumination in two corners, owing to the negative being raised out of the field of the condenser,—that is if the whole negative is being enlarged. Its true and useful purpose is when a part only of a negative is being used: it serves to bring this part more toward the center of the field, and so secures better lighting by the condenser and definition by the lens. The tilting movement (i.e., angling the negative away from its normal position perpendicular to the axis of the lens) is for the very rare cases when it is desired to correct in the enlargement any "drunkenness" of drawing, due to the

camera having been tilted up or down when the negative was made. It is not enough of itself for this; the easel requires to be angled to the same degree but in an opposite direction, thus:

/ \ or \ /
Neg. Easel Neg. Easel

otherwise the enlargement will have a squat or narrowed distortion, according as the camera was pointed, up or down in the first instance.

A rising and falling movement of the lens in the front board is a thoroughly bad movement in principle, since it displaces the lens from alignment with the condenser. It is very liable to cause shadows on the easel, although there are circumstances when it is of great service. If, for example, you are enlarging the head only from a full-length figure on a cabinet negative to 12 x 10, you will not be able to center the required part of the subject by raising or lowering the negative, and thus a good part of the enlarged head will fall off the easel unless the latter is of uncommon size. But an up-and-down movement of the lens will bring the head central on the easel, and, in these conditions (working from a small part of the negative), the illumination will be satisfactory, or can be made so by diffusing the light with ground glass.

Illuminants for Enlarging

In taking up the choice of an illuminant for enlarging, I need say nothing of the use of the Cooper-Hewitt M-shaped tube lamp, since this is used just as "a north window against a clear June sky" would be used, the camera being placed in position so that one-half inch space separates the negative and the diffusing screens, which themselves are placed about three and one-half inches from the M-shaped tube, and the space between the light or lamp frame and the camera being perfectly closed, so that all the light reaches the projection lens through the negative. The same manipulation suffices for the operation of the Gray Parallax Lamp.

With Condensers

For enlarging lanterns using condensers, the more powerful illuminants are advised, as shortening exposures especially with gaslight papers. An arc light heads the list.

It is best of the right-angle pattern, although several convenient "scissors" and parallel lamps are sold which are self-feeding, and are run from the holder of an ordinary electric bulb. They serve excellently for enlarging, and call for next to no attention in use. Other high-power electric lamps are the Nernst and the new nitrogen bulb. The latter must be of the focus pattern, the ordinary type of metal-filament lamp is almost useless with a condenser. These nitrogen focus bulbs can now be had of high power from 300 to 4,000 cp. The Nernst lamp, owing to the area of the filaments, calls for an aperture of at least *f*/6 (better, *f*/4) in the projection lens, otherwise it is very difficult to get even illumination. If you do not want to incur the cost and trouble of an arc, you should choose a Nernst or a focus nitro bulb, the latter for preference.

Incandescent Gas Mantles

With gas, a good upright incandescent burner is the usual choice. Remember, it is the brightness not the size of the incandescent mantle which matters. Burners vary considerably for enlarging (with a condenser) we want the utmost brightness over a small area. In fact, it is a good plan to fit a cylindrical tin-plate screen around it, the burner, with a hole about an inch in diameter in the screen being placed so that the hole comes opposite the brightest part of the burner. This helps even illumination, and does not lessen the working power of the light.

Acetylene Spirit-Vapor

In the absence of gas or electric supply, the available illuminants are acetylene, and the self-contained incandescent burners consuming vaporized alcohol or methylated spirit. In the past I have always fought shy of acetylene from distaste of the mess and trouble of a generator, but the "dissolved" gas supplied in cylinders for motor-car head-lights has now made this illuminant a very handy though somewhat costly one. Of the spirit-mantle burners, there are a number of patterns, most of which work by pressure from a small hand pump. I can speak with satisfaction of one lamp of this type, but on another principle, viz. the "Luna" of W. C. Hughes & Co., London. The spirit vapor is supplied from a small boiler, itself heated by a minute

spirit flame. Thus the lamp will run for an hour or two with scarcely any attention, yielding a fine light.

The Lens for Enlarging

This is an appropriate place to say a word on the lens to be used for enlarging. Generally speaking, a lens which will cover a plate of the size of the negative to be enlarged is a suitable one for the enlarging process. The focal length will therefore be about the diagonal of the negative; if it is much longer, it makes the apparatus larger without any advantage. Equally important is the aperture. For use with condensers, and when enlarging on to gaslight paper by any system, the lens should also be of large aperture—*f*/6 or *f*/4. A lens of this large aperture is under no disability from its lack of "depth of focus," because, in enlarging, we are reproducing a flat subject. It should of course cover the plate at its full aperture, a condition which fairly well fixes its focus at not less than the diagonal of the plate. For condenser enlargers (or in fact any other type), a lens of six and one-half inches focus is very suitable up to 4 x 5 size: 8 or 9 inches for 5 x 7. The *f*/6 or *f*/4 aperture will mean immensely greater ease in getting even illumination. Portrait lenses are not generally suitable, as they are deficient in covering power for their focal length. They have their use in enlarging portrait negatives where loss of definition toward the margins is of small moment. The lenses fitted to the cheaper stereopticon lanterns are unsuitable, because (in addition to poor covering power) they do not "work to focus;" i.e., the image which is seen to be sharp on the easel is fuzzy in the developed enlargement. A curious feature many high-grade anastigmat lenses is that they do not work to focus when the source of light is an inclosed arc-lamp. When they are so used, it is necessary to shift the easel a certain distance (found by trial for various degrees of enlargement) between focusing and exposing paper.

Box Illuminators

As regards the use of reflected light alone or in admixture with direct rays, little need be added to what has been said in a previous paragraph. These boxes depend very

largely on the proper condition of the reflecting surface. It should be repainted with a good quality flat paint if it shows signs of yellowing. A box on either system is used with any suitable focusing camera by making a light-tight connection between the two when the whole is used in a darkroom, like an enlarging lantern; or the box may be simply stood against the negative when a closed enlarging box or camera is used. A very ready way in which to convert any focusing camera into an enlarger is to make a stout box, say 5 feet high, 2 feet wide and 1 foot deep. The front (5 x 2 feet) is open whilst the top (2 x 1 feet) is pierced to carry a 4 x 5 negative in a central position, with kits for smaller sizes. To the under side of this top piece and pointing vertically down, the camera is fixed by its back frame, just under the negative, whilst upon the top piece is fixed a light-tight bottomless box, say 1 x 1 x 1 feet, holding five metal-filament lamps, one in each corner and one in the middle. This box is lined with sheet asbestos and fitted with a front door for access to the negative. It is made light-tight with what is really a shelf, carrying camera and negative by deep filets of wood over which it fits. The only remaining joinery is a series of strips nailed opposite each other to each side-piece of the main box, to support an easel board at different distances from the lens. There you have a very efficient enlarger taking very little floor space and always ready for use. It is a glorified Brownie enlarger, i.e., with the advantages of visible focusing, various degrees of enlargement, and the use of one's own wide-aperture lens.

Using Magnesium Ribbon

I refer only briefly to the means for illuminating a negative in this way, because it is seldom one needs to use it. But at times it is useful to know how to get a perfect light for enlarging with only two sheets of ground glass and some magnesium ribbon. Place one sheet of ground glass close behind the negative; the second large piece a little farther back. The area to be lighted must be much larger than the negative, e.g., 5 x 6 behind a 3 x 4 negative; the rule being to add twice the distance from the negative to each dimen-

sion of the latter in order to get the size of this area, which is marked on the large glass with a pencil line. Now cut off a supply of ribbon lengths, each about four inches. Hold one in a pair of pliers, light it and zig-zag it lengthways to and fro close behind the ground glass, starting along the upper pencil line and lowering the ribbon an inch on moving it in the opposite direction. Burn the next piece in a similar way, but zig-zagging *up and down* at inch intervals, and continue using up the lengths in alternate directions.

This method gives a very even illumination. It is impossible to say how much ribbon is wanted, but try a dozen lengths, used as above, for three-times enlargement on soft gaslight paper with an *f*/6 lens.

Enlarging with Daylight Boxes

In thus considering at some length the different types of apparatus, I have necessarily had to refer to their mode of use. Therefore, in turning now to practical work, we can take a good deal for granted, and need not bother ourselves particularly with the principles concerned in the use of apparatus. With a fixed-focus box, such as the Brownie enlarger, choose a thin negative for a first trial. If on film, place it between two thin sheets of glass. Then, in the dull light of an ordinary room, slip the sheet of gaslight paper into place, close the box, cover the negative with a cloth and stand the box pointing to the sky, but not in direct sunshine. With a paper such as "soft" Velox try ten minutes as a first trial exposure. In good summer light it may be enough with a thin negative. Then take the box indoors and, again in a dullish light, develop the paper. Make sure that the developer is in good order by trying it first on a contact print. If you want to be really economical, "waste" a few sheets of paper (by cutting each into, say, 4 pieces) and expose each separately for a different time, at each exposure testing the strength of the light with an exposure meter. You find, say, that the best result is got with twelve minutes' exposure, and that the meter time is ten seconds. That will tell you that the enlargement requires $12 \times 60 \div 9$ ($=80$) seconds for every second of the meter-time; a useful basis for all future

work, in which you then have only to use your own judgment as to the density of the negative.

In using an adjustable enlarging box, such as I have described on page 576, the method of use is exactly the same except that the enlarger is first carefully set to the required scale of enlargement. In finding a basis for exposures, expose strips as just suggested, with the enlarger set to two times. Then, for greater degrees than this, you require to multiply the exposure found from the meter-time by one or other of the factors I have already given on page 587.

Enlarging with Daylight Camera

With an apparatus of this kind, there is always a separate holder for the sensitive paper. The gaslight paper is placed in it by a safe light, as before. But, instead of the sharp focus being secured by the maker of the enlarger, you must focus the enlargement yourself on the ground-glass, at the same time adjusting the extension of the camera to get the required degree of enlargement. A magnifier is a great help in getting sharp focus easily, but see that the ground glass is of finest grain, otherwise it is hard to tell when you have got the best focus. An enlarging camera of this kind allows you to use a large-aperture lens. Therefore first see if the full aperture serves for definition to the corners, using a thin negative with clear scratches on it for this test purpose, and carefully comparing the definition of lines in the middle of the screen with that of those in the corner. Having found the largest aperture which can be used, stick to that, first finding the right exposure for a two-times enlargement, as directed in the previous paragraph. Compared with the cheap enlarging boxes, the exposure with *f*/8 lens will be one quarter; with *f*/6, one eighth; and with *f*/4.5, one twelfth; any of which makes all the difference when using gaslight papers.

The Room Enlarger

Here, again, first find the largest stop which can be used. Next, make sure that there is not enough stray light falling on the easel to fog the paper within, say, 15 minutes. Some may leak in at the junction of the camera and the shutter in the window-frame. A focus-

ing cloth laid round the back of the camera will exclude it and prevent general fogginess in the image.

Stray light from other parts of the room can be cut off from the easel by arranging a hood or short tunnel of black card to project about a foot from the easel. There may be no need to do either of these things, but you should make sure the paper will not be fogged during the time of exposure by pinning a bit of it to the easel under a card with a hole cut in it, and letting it stay there for the time of an average exposure (with the lens capped of course). On development there should be no sign of the shape of the hole.

Having placed the negative in the kit, rack out the the camera to get the size of picture you want, and focus on matt white paper pinned to the easel. There is nothing better than thin Bristol-board for focusing on. If you find it difficult to tell when the sharpest focus has been secured, remove the negative and replace it by an old one with clear scratches on it, or by one of the ruled screens sold for the purpose. Either will make focusing quite easy. Then put back the negative. Don't touch the easel or lens again, except to put the orange cap on the latter and pin the paper to the easel so that the picture falls "squarely" on it.

Shading during Exposure

Here, as when using an enlarging lantern, you can do a great deal by shading the paper during exposure, in order to get a quality in the enlargement which would never be secured without this dodging. One chief improvement which can be made in this way is to tone down the sky from the blank staring white to a tone which is more truthful, or so as to bring out clouds actually in the negative. If the horizon is fairly level, any large piece of card is held about three inches from the paper so as to shield the landscape part of the picture. It is kept slightly on the move (up and down) for a part of the exposure. What this proportion should be is a matter of judgment, but it is surprising to find that negatives can do with a part being shaded for half or three-quarters of the whole time with great advantage. If the horizon is irregular in outline, a mask can be cut by roughly tracing it with a pencil

on a sheet of stiff paper (laid against the easel before pinning up the gas-light paper) and cutting out with a pair of scissors. In other negatives, parts can do with shading, in order to avoid over-exposure of the shadows of the subjects. The use of the mask saves such parts from merging into large ugly black masses in the enlarging, and it preserves the differences of tone which are probably in the negative. In fact, it is not too much to say that the facility of shading afforded by the open easel has more to do with the making of enlargements of outstanding quality than any other part of the process. The professional enlargers will hardly ever be satisfied that an enlargement is the best the negative will yield without making use of this control during exposure.

Enlarging by Artificial Light

When using either an enlarging lantern or an illuminator fitted to your own camera, the working conditions are those of the room enlarger. The room can be lighted enough for comfortable working so long as the easel is not exposed to light which will fog the paper. Personally, I prefer to work in plenty of fairly bright yellow light (obtained by swathing a 32 c.p. bulb in yellow fabric), rather than make do with a feebler white light. One can then feel secure that no harm is coming to papers if they have to be left uncovered. Yellow light in the enlarging room is, in fact, a necessary safeguard when using the less-powerful enlarging lamps, for with them one generally has to fall back on the extra-rapid gaslight papers, and they are too sensitive to be handled with safety in any white light which allows you to see what you are doing. At the same time, there is not the need for the absolute exclusion of white light, which must be the rule when exposing or developing bromide paper.

Using the Enlarging Lantern

The proper way to use an enlarging lantern is first to rack forward the lens-front (with the negative in the lantern), so as to get an enlargement of the required size on the easel. Then take out the negative and adjust the light as regards centering and distance from the condenser until a perfectly even bright disc

easiest to remove. Half an hour's soak in a bath of: chrome alum (1 oz.); water (20 ozs.); with a dram or so of hydrochloric acid added, will usually clear it off. More often than not, a negative which is stained is also too dense. How best to reduce it is beyond the scope of the present monograph, but I would say that the hypo-ferricyanide, as a rule, is not a good reducer for negatives to be enlarged. Persulphate is better, as is also the method of reduction by bleaching and re-development which, with other processes, is the special subject of THE PHOTO-MINIATURE No. 143. I advise my reader to practise this process on a few old negatives, for he will find it the means of saving time and often of securing a very much better enlargement.

Development My first advice is not to stint the quantity of developer. Use ample for quickly covering the whole sheet, say 8 ozs. for 8 x 10 size. You will then make sure of even development. If the paper is of rough surface, like Kodak Royal, let it soak for five minutes first in plain water. Do the same if it is "card" substance, but otherwise flow the developer over the dry sheet. Next, keep the paper under the solution, face up, of course. To be constantly lifting it up to have a look at it is a prolific cause of yellow stain in the whites, with many papers. It is a good plan to have a bit of the paper protected from all action of light, e.g., by the clips in a box-enlarger on the metal-mounted pins on the easel (the latter, therefore better than the glass push-pins). These patches should keep white during development. If they don't, they tell you that your developer is fogging the paper and needs a drop or so of 10 per cent bromide solution, or that the light in which you are working is having the same effect. If these patches keep clean and yet the enlargement as a whole is flat or veiled, you know that exposure has been too long or that the paper is of too "soft" a type for the negative. Generally speaking, in reference to most gaslight papers, the best results are got by "straight" development; that is, by using the maker's formula or some other which will quickly yield an unfogged print of full depth; not by adding more of A or B for a particular

effect. Most makers advise a metol-hydroquinone (M. Q.) developer, which, like eikonogen-hydroquinone, gives a plucky print. Metol or weak Rodinal tends to softer effects. Amidol (diamidophenol) makes for contrast. Bearing in mind the wide difference in the papers themselves, this choice of developers is ample for realizing one's preference for softness or vigor and for making good the deficiencies of our negatives in one respect or the other.

Developers Formulas for M.-Q. developer are legion. That for Velox (the original gaslight paper) is one which I have rarely found wanting with any paper of this kind. It is:—Metol, 14 grs.; hydroquinone, 60 grs.; Soda sulphite, cryst., 1 oz.; soda carbonate, cryst., 800 grs.; potass. bromide, 10 per cent solution, 20 minums; water, 20 ozs. This stock developer is mixed with an equal bulk of water for a "soft" paper. Broadly speaking most M.-Q. developers for gaslight paper have pretty much the composition of the Velox formula, viz, metol, ¾gr.; hydroquinone, 3 grs.; soda sulphite, 22 grs., and 40 grs. soda-sulphite in each ounce of water or rather half of each of these quantities as the developer is used for soft paper.

Eikonogen-hydroquinone is a slower working developer but gives a tone more toward a warm black—a more pleasing tone than the blue-black of M.-Q. and warmer still on fuller exposure and addition of more bromide. Formula: Eikonogen, 30 grs.; hydroquinone, 10 grs.; soda sulphite, cryst., 160 grs.; potass. carbonate, 80 grs.; potass. bromide, 15 grs.; citric acid, 20 grs.; water, 20 ozs.

Metol (for soft effects): (*A*) metol, 400 grs.; soda sulphite, cryst., 8 ozs.; potass. bromide, 50 grs.; water, 40 ozs.; (*B*) potass. carbonate, 8 ozs.; water, 40 ozs. Take 3 ozs. A, 1 oz. B, and make up to 8 ozs. with water; or omit the water for still softer results. Amidol (Diamidophenol): Soda sulphite, cryst., 500 grs.; water, 10 ozs. Dissolve and add 10 per cent potass. bromide solution, 20 minims, and amidol, 50 grs. Mix 1 part of this with 1 or 2 parts of water. Won't keep longer than a day or two. Rodinal, 1 part with 10 to

20 parts water and with addition of 10 per cent bromide solution in the proportion of 20 to 30 minims to each 10 ozs. of developer, or more if the paper shows a tendency to veil. Rodinal used strong (1 to 10) readily yields strong black prints: the weaker developer (1 to 20) is well suited for softer effects but the time of development must be short.

The Use of Bromide

Gaslight-papers are most sensitive to bromide in the developer and the general safe rule is to use only just enough to give clean whites. Test the developer for that by making a contact print from a good negative. You can judge if your developer is right or wants a drop or so of 10 per cent bromide solution to make it work cleanly. With many papers too much bromide—even a drop or two in excess—will spoil the good color of the prints, making it of a rusty shade. The extra-slow gaslight papers, however, will stand enormous additions of bromide without ill effect as regards color.

Fixing

Although some gaslight papers can be fixed in a plain hypo bath without risk of stain, no prints will come to any harm in a bath made with the "acid-fixing salts" supplied by makers of papers. And some brands absolutely require this form of bath in order to avoid stain. I make my own bath by dissolving 4 ozs. hypo and ½ oz. potass. metabisulphite in 20 ozs. water. Whatever fixer you use, make sure of three things, first, that the print is completely covered by the solution when it is first put in and, second, that it gets some movement every now and then, whilst fixing. A print "paddle" (to save hypo from one's fingers) is an indispensable aid to this proper use of the fixing-bath. The third point is—Don't let prints see strong light until they have been in the wash-water for a minute or two. If you fix for ten minutes, with observance of the above points, you will never have to complain of yellowed whites or light brownish patches on your enlargements.

Washing

I know of no satisfactory washing-machine for 8 x 10 or larger prints. For a few prints there is no better method than to let them soak first in clean water for ten or

fifteen minutes and then to transfer them one by one into a second dish of clean water, repeating this latter operation four or six times every five minutes or so. For washing one or two enlargements without this attention, the best plan is to rig up an inclined board in the bath so that the water runs evenly over the print by connecting a length of pipe to the faucet with a rubber tube, the pipe being closed at one end and pierced with holes about an inch apart. But beware of letting the water jets strike the print. You can avoid that by nailing a strip of wood across the board (at its upper end) over which the streams from the jets flow, as over a weir, in one fairly even course.

Bromide Enlarging

To come now to the use of the much faster bromide papers. Everything that I have already said about apparatus applies equally to bromide papers but with certain qualifications. With bromide paper practically any light can be used. The speed of bromide is roughly sixty times that of soft gaslight paper and therefore times of exposure which would be minutes with gaslight are seconds with bromide. Thus, for average work a very strong lamp such as the arc or focus bulb is too fast. It makes the exposures so short that it is difficult to time them accurately or to shade parts of the picture when using an enlarging lantern. For the general run of amateur work an incandescent gas-burner or a medium-power Nernst or nitrogen bulb is strong enough. Moreover too strong a light flattens the result in a way which is not remedied by cutting down exposure. The professional enlarger who has to deal with all kinds of negatives will often keep an enlarger fitted with an oil lamp solely for the purpose of getting passable contrast from negatives which are so lacking in vigor that they are "killed," as it were, by a full-power light. A second qualification is that the room in which bromide paper is handled for development, or on the easel must be free from stray white light. The "gaslight" conditions won't do. The light should be a bright orange—not yellow, which is not safe with the faster bromide papers, nor yet ruby which prevents you from judging the appearance of prints properly.

Bromide paper, in fact, has a speed about that of slow landscape plates and requires to be handled with corresponding care.

The Negative for Bromide This is where the pinch is felt in comparison with gaslight. Although bromide papers differ to a certain extent as regards the vigor which they give, they are all of them less competent to make good any deficiency in the negative than is gaslight paper. It isn't so much a matter of thinness. So long as the negative has snap and brilliance, is in fact of clean, fogless character without veil over it, it will make a good bromide enlargement despite its thinness. It is the poor washy-looking negative, such as we get by over-exposure or other faults that fares so badly at the hands of bromide. On the contrary the vigorous negative is handled better on bromide than on gaslight and when it comes to positive hardness in a negative—hardness which does not yield to an intense light in the enlarging lantern—there is a special way (Sterry's) of getting a harmonious result. In other words if your negative is the thin brilliant type which prints well by almost every printing paper, it will yield a fine enlargement on bromide. If it is of the dense over-developed kind, normal or excessive in contrast, then you *must* fall back on bromide on account of its speed.

Bromide Papers Most bromide papers are of the speed I have already mentioned in comparison with gaslight. Some makers e.g., Kodak and Ilford, make a "slow" variety of about one-third the speed. Though there is not the same range in speed and in contrast as there is in gaslight papers. Yet, as regards surface and tint, bromide affords all the varieties one can ask from papers of enamel gloss and semi-gloss through those of dead matt to those of rough surface, each grade being made of cream tint as well as white. The range in this respect is fully as great as with gaslight papers.

Developers Broadly speaking any developer which is suitable for gaslight paper serves well for bromide if mixed with an equal bulk of water or with twice or three times its bulk if

soft gray prints are desired. The amidol developer is first rate for almost every bromide paper, as is also metol and metol-hydroquinone.

Development

Whatever the developing formula—and one well-balanced formula is as good as another—the great thing is to expose so that you can develop fully. By "fully" I mean that the developer can be kept on the exposed sheet of paper for at least four minutes without the picture becoming too dark or the highlights veiling over. The image should develop up steadily and then come practically to a stop when of full vigor. That is the sign of correct exposure and a suitable developer. If, despite reduced exposure, the print will not develop in this way, you probably want a drop or two more bromide in the developer. Of course, no paper will stand indefinite treatment in the developer without fogging, but four minutes is a fair time; a good paper ought to stand it. Too many workers make a mistake in the other direction. They expose too long and take the print out of the developer within a minute or so to save it from darkening and fogging. The best results, rich, and vigorous, will never be got in that way, and the inferiority will be still more marked if the prints are afterward sulphide-toned. Thorough development, in the sense just mentioned, is really the chief essential in securing fine sepia tones by the sulphide method.

Enlarging from Hard Negatives

A negative which is hard either from under-exposure or over-development, yields an enlargement which shows still more harshness than a contact print. It may of course be remedied with the persulphate reducer or by bleaching and partial re-development (see No. 143 of The Photo-Miniature for details), or may simply be bleached, enlarged whilst in that state and then re-developed. The ferricyanide—bromide bleach used in sulphide toning is convenient for this purpose. The bleached negative is washed for a few minutes and dried in the dark, as it darkens in a strong light. For re-development the negative needs only to be left to itself in a 1:10 Rodinal developer for a few minutes.

There is another way of getting a soft enlargement without tampering with the negative viz., the bichromate method devised by Mr. J. Sterry. Make a stock solution of potass. bichromate by dissolving 1 oz. in 10 ozs. of water, adding one dram of 880 ammonia: This is used to make up a very much weaker bath in which the sheet of bromide paper is immersed for three minutes, after exposure. The paper is then washed for half a minute and developed as usual. The strength of the working bath varies according to the paper: from 1 to 2 drams bichromate solution in 10 ozs. of water is an average strength. For this method, the exposure requires to be ample to bring out the detail in the highest lights when developing in the usual way. Test for this by exposing a small piece of paper, placed so as to include some highlights. The bichromate bath enables this highlight detail to be developed up without the shadows becoming too dark, yielding an enlargement in a full range of tones. This softening effect can be overdone: if too much, use less bichromate stock in making the working bath or immerse for a shorter time. One or two trials will show the effect produced on a given paper. The development is as usual except that it is slower and the solution should be used once only as it picks up a little bichromate from the paper and thus tends to upset one's calculations. Another point is that the fixer should be an "acid" bath in order to clear away any yellow bichromate stain. With a little experience, the method is a very useful one in dealing with negatives which would otherwise be impossibly hard for enlarging. So far as my experience goes, it is suited only for bromide papers —not for gaslight.

Soft Effects

The foregoing methods relieve hardness in the enlargement simply by avoiding the production of intense blacks which often are so solid and heavy as to give a "soot and whitewash" effect. This defect may be mitigated to some extent in a very easy manner by breaking up the definition of the lens in some measure by means of a screen of "bolting silk" or chiffon. The former is particularly suited for use with vigorous

enlargements as it breaks up the solid blacks. The latter (used on the lens) is much less effective in breaking up shadows, but introduces a general delicate softness of definitions which is very charming in subjects of either strong or medium contrast.

Bolting silk is supplied of fine, medium or coarse mesh by the Eastman Kodak Co., and requires to be stretched tightly on a flat frame. This is placed a short distance from the paper. If the silk is in actual contact it produces a fine pattern over the enlargement which breaks up the shadows chiefly but is without effect on the general softness. In this position it has practically no effect on the definition of the lens. But a very small separation (¼ to ½ inch) adds a general diffusion of definition as well as a reduction of contrast, producing a very pleasing effect. The action of the silk is still greater as regards fuzziness the further away it is placed, but the best results are obtained with the screen only the fraction of an inch from the paper. In order to ensure even action, it is well to cut one or two extra frames each of a different thickness of card. One or more of these is laid between the frame supporting the silk and the surface of the easel to serve as packing, and the frame proper pressed against the packing during the exposure. The enlargement is first focused sharply without the screen in position and care given to pinning the paper flat to the easel with the ordinary flat-headed drawing-pins. The effect of the screen can be further modified by using it for part only of the whole time of exposure. The screen of course cuts off some light, requiring about one-third increase in exposure.

Chiffon is used as a cap on the lens. Two or three thickness of the black material are strained over a short cardboard collar which will fit easily on the lens-hood. The fuzzy effect is much more delicate than that with the bolting cloth and so is the softening effect upon contrast. But it is a very handy method and one yielding enlargements of most harmonious soft appearance, especially pleasing in portraiture and for exhibition prints larger than 11 x 14 inches..

Clouds in Enlargements The space of the sky in a landscape enlargement calls for suitable clouds far more urgently than in the case of a small print. It is rare to find that the negative contains clouds or that the latter, when they are there, develop up satisfactorily in the enlargement. Fortunately it is easier to insert clouds in an enlargement than in a contact print. The most satisfactory plan is to impress the landscape, whilst shading the sky; then the cloud, whilst shading the landscape; and then to develop the doubly exposed paper. The first thing is to make the two masks for the shading. To do this at one stroke, pin a sheet of thin card to the easel and focus the landscape enlargement on it. Then trace with a pencil the sky line of the landscape on the card and with a sharp pair of scissors cut the card in two along the line. The landscape part forms the mask when exposing the cloud negative and *vice versa*. Next pin up the bromide paper and make the exposure from the landscape negative. If this latter has a dense sky, well and good, but if not, hold the sky part of the mask close in front of the bromide paper in register with the image on the paper but keeping it very gently on the move. Now place the orange cap on the lens and with a soft lead pencil faintly trace the outline of the sky on the bromide paper. This is necessary as a guide for holding the mask when printing the cloud negative. The next step is to remove the landscape negative, insert that of a sky in the lantern and adjust the sky in the enlargement with the pencil line as an indicator. Now bring the landscape part of the mask into rough register a very short distance from the paper and make the exposure for the cloud negative, keeping the mask in slight up-and-down movement. The exposure will usually be a good deal less than for the landscape. It is necessary to ascertain the correct time for each negative by preliminary trials with small pieces of paper, developing each pair together for the same length of time. The whole picture is now developed, when cloud and landscape should be obtained without any sign of join. Usually the clouds are of much lighter tone than the landscape, and therefore any error in

adjustment of the mask may better be in the direction of overlapping than of leaving an unexposed line above the edge of the landscape.

Toning Enlargements

The beauty of many enlargements is greatly enhanced by toning to brown or sepia for the reason, apart from that of the more pleasing color, that the shadows of a toned print possess an extra richness or transparency. Moreover, with the toning processes now available, there need be no suspicion of impermanency. In fact, the sulphite process, the best of all methods, improves a bromide or gaslight print in this respect. While the details of toning methods are beyond the scope of this monograph—they are fully dealt with in No. 103 of The Photo-Miniature—let it be repeated here that a good strong thoroughly developed print is more than half the battle in securing the finest results in toning.

Mounting Enlargements

The mounting of an enlargement differs in no respect from the mounting of a print except that one's enlargements are generally made for framing and there is not the necessity to mount in the ordinary way. It is sufficient to attach the enlargement to the mount by a strong mounting paste—the ever-reliable Higgins—at the two top corners. The chief thing is to get the print to lie flat, gelatine papers having an obstinate habit of curling. This is overcome by following a particular system in drying. First blot off the print under dry blotters, roll it face out between "World" blotters on a cardboard cylinder, then pinning the print to the outside of the cylinder and putting it in a warm place so that it gets bone dry while thus bowed outward. This will make the print keep flat afterward. As regards trimming and placing on the mount as well as for the many nice points connected with the choice of color and surface of the mount I must refer to No. 102 of The Photo-Miniature on "Trimming, Mounting and Framing."

Simple Working-up

A very little skill with the pencil or brush is all that is needed for the improvement of the finished enlargement by hand. The two chief directions in which this

improvement is to be made are the touching out of white spots or marks and the strengthening or reduction of other parts particularly the dark and shadows of the subject. For spotting out white marks, due to dust in the negative or air-bells in the developer, the best thing is to touch them out with a finely pointed hard pencil. If the pencil work shows glossy, it can be made matt by holding the print for a few seconds over steam from a kettle. For sepia-toned prints, use a fine sable brush and water-color. Black specks, when they occur, are best scraped off with the point of a sharp penknife or retoucher's etching blade and then touched with pencil and brush to match their surroundings. The Photo-Miniature, No. 133, gives explicit instructions for the finishing of enlarged portraits with the air-brush, water colors and pencil.

With this we have fairly covered our field of work as far as enlarging on gaslight and bromide papers is concerned. It is presumed that the reader will supplement what he has here learned by a careful reading of the instructions and booklets published by the manufacturers whose papers and apparatus he uses in his work. By such reading the information here given will be readjusted to practical application, varying from point to point according to the peculiar requirements of the paper employed, and the making of successful enlargements will become as interesting and as profitable a hobby as the making of prints by contact.

George E. Brown

BOOKS

The Photo-Miniature Series: No. 103, Toning Bromide and Gaslight Prints; No. 106, Oil and Bromoil Printing; No. 133, Finishing Portrait Enlargements with the Air-Brush, Water-colors, Pencil, etc., and No. 143, Remedies for Defective Negatives, will be found useful as supplementing the methods given in this monograph.

Notes and Comment

Up to the date of putting this issue of The Photo-Miniature on press, we have no information from the English publishers of "Photograms of 1915" as to when the book can be expected on this side. Obviously it cannot be ready for delivery here before the end of the year, but we look for its arrival some time before the end of January. Readers of this note who desire to secure a copy of the book will do well to place their order in advance with their local dealer, as the American edition is likely to be entirely sold out when the books arrive. This information applies with equal force to "Penrose's Process Yearbook 1915–16," usually published in December, but not yet shipped from London by the English publishers, so far as we are advised. "The British Journal Almanac of Photography 1916," is announced as to be published in London at the end of January, which means that it will not be available in America until the end of February.

The steadily increasing interest shown by amateurs and professionals in the making of enlargements from small negatives will, I hope, receive considerable impetus from the summary of present-day methods of enlarging so clearly presented in this issue of The Photo-Miniature. The writer of the monograph proceeds on the common-sense presumption that the reader will use one or another of the several commercial enlarging equipments which can be bought from photographic dealers.

The new Acme Enlarging Lantern, just introduced by the Acme Enlarging Lantern Co., 81 Nassau Street, New York, should not be overlooked by those purchasing an enlarging equipment. It combines a high-grade stereopticon for the projection of lantern-slides

with all the facilities of an efficient enlarging outfit, and can also be used for the making of lantern-slides by reduction. Its manipulation is very simple, and especial care has been taken to secure the utmost accuracy in movement and result. The bellows has an extension of 21 inches, the lamphouse is so constructed that it may be made larger or smaller, as desired, and the illumination is provided by a 250-Watt nitrogen-filled stereopticon bulb, which gives a pure bright white light, capable of piercing the densest of over-exposed, over-developed negatives. The price of the combination is extremely moderate. Those interested should send for the illustrated booklet.

Insomuch as many advertisements of the Bausch & Lomb Model B Balopticon, now appearing in the photographic magazines, do not mention its usefulness other than as a stereopticon for the projection of lantern slides, it may be worth pointing out that this model is readily adapted for making enlargements, from the popular small-sized films and plates, up to 11 x 14 inches, vertical and horizontal. It may also be utilized for the making of lantern slides from negatives of any size up to 5 x 7, as well as for the projection of slides. It can be fitted with a 250-Watt nitro Mazda lamp, or a 4½ ampere arc or an acetylene burner. This is one of the most popular lantern equipments in the American market and has given satisfaction to thousands of enthusiasts.

I am glad to learn that the business of the Portland Photo Supply Co., Portland, Oregon, has made such strides as to necessitate new and larger quarters for its accommodation. The new store is located at 333 Morrison Street near Broadway, Portland, where western readers will find a complete stock of photographic specialties and a thoroughly equipped personal service.

Second International Photographic Exposition

At the Second Annual Exposition of Photographic Arts and Industries, to be held in Cleveland, week of March 6, in connection with the Fourth Annual Convention of the Photographic Dealers' Association of America, considerable attention will be paid to the exhibition of representative photographs in the Photographic Competition to be held under the auspices of the Photographic Dealers' Association of America.

The fact that this Exposition will be attended by at least 150,000 persons, in addition to the delegates to the convention of the Photographic Dealers' Association of America and numerous manufacturers and industrial representatives, gives an unusual and interesting aspect to this feature of the Exposition.

The prints for this contest will be suitably arranged and hung by a Committee of men who have had experience in the display of photographs, and every effort will be made to present the merits of the pictures to the best advantage.

Cash prizes accompanied by a Diploma will be awarded to the most meritorious exhibits in each class. Diplomas of Merit will also be given to all prints rated above 75. The awards will be made by a Jury composed of three well-known amateur and professional photographers.

The Professional Class will be open to Professionals only. This class will be confined to professional portraiture and limited to five pictures from each entrant.

The Amateur Class is open to Amateurs only, and will comprise amateur prints of every description, limited to five prints from each entrant.

The following cash prizes will be made in the Pro-

fessional Class: $50 Cash—First Prize; $25 Cash—Second Prize; Five $5 cash prizes for the next five best prints. Each of these awards to be accompanied by a Diploma. All other prints of merit will receive a Diploma of Honorable Mention.

The following cash prizes will be made for the Amateur Class: $50 Cash—First Prize; $25 Cash—Second Prize, and Five $5 Cash prizes for the next five best prints. Each of these awards to be accompanied by a Diploma. All other prints of merit will receive a Diploma of Honorable Mention.

To avoid needless repetition and to keep the exhibition upon the high plane desired, only such prints will be shown as have passed a Competent Examining Board composed of prominent artists and photographers.

The Exposition Management believes that the opportunity afforded photographers to display their work, under the reasonable rules formulated for this competition, to such a large number of interested people, will induce a liberal representation in all its branches. Prospective exhibitors are urged to send for entry blanks without delay, so that preparations can be made for the proper display of their pictures. Address all inquiries to the Print Committee, International Exposition of Photographic Arts and Industries, 241 Engineers' Building, Cleveland, Ohio.

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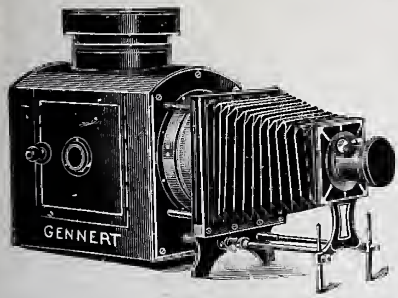

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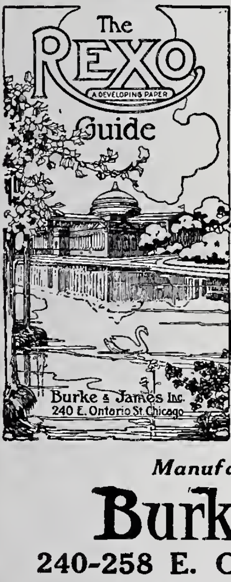

will enable you to choose the proper grade for every class of negative. We will mail you a copy on request. It is a valuable booklet brimful of practical information on developing papers in general and REXO in particular. You ought to get a copy and study it. It is the best guide to better prints.

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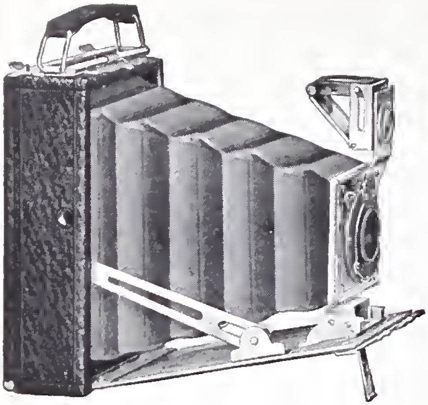

The light *will* creep in and while it may not be visible to the eye its presence is shown on the fogged film. The Kodak Film Tank is light-tight—*absolutely*. Against its metal surface the most persistent light ray gives up in despair. With the film safely inside and the tank cover snugly in place, the film is *safe*—there is no question about that. Compare a product of the tray with a negative developed in the Kodak Film Tank. The latter will have a snap, a brilliancy compared with which the tray-developed negative seems lifeless. And the contributing cause is the fact that tray-developed film is more or less fogged.

The convenience is the most obvious advantage of the Kodak Film Tank, although, to the practical amateur, the fact that it will yield him better negatives is of most importance. However, there are few amateurs who will miss the stuffy darkroom for with the Kodak Film Tank you can develop your films anywhere, anytime—in broad daylight if you will. And then its manipulation presents a happy contrast to the awkwardness of tray development. The film is placed on a reel in the winding box where it is wound in combination with a light-proof apron. Protected by this apron it may be safely removed and lowered in the solution cup to remain for twenty minutes. It is then ready for the fixing bath.

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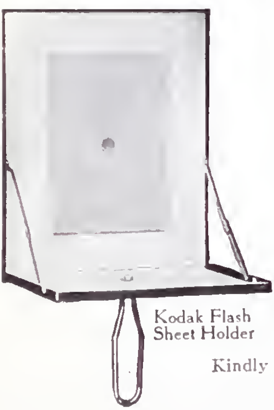

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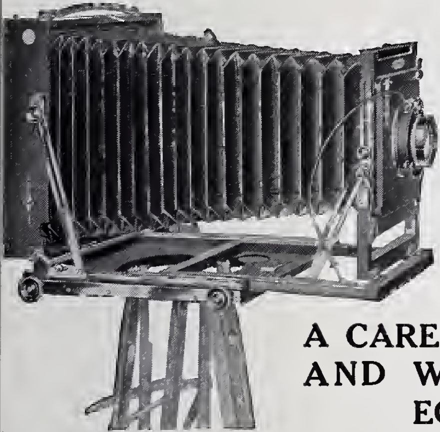

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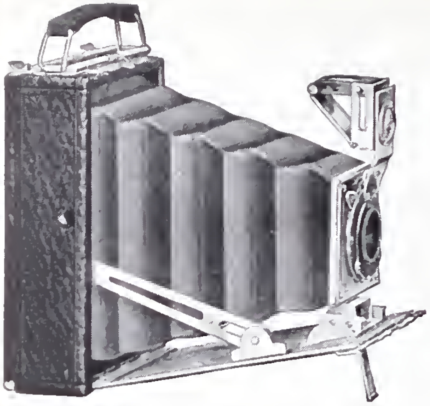

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Premoette Jr.

To the pleasure of being out-of-doors, this little camera adds the further pleasure of making pictures of all that makes the out-of-doors worth while.

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Premoette Jr. No. 1, for 2¼ x 3¼ pictures, $5.00

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Premo catalogue describing these and many other desirable models at prices from $1.50 to $150.00, free at the dealer's, or promptly mailed by us on request.

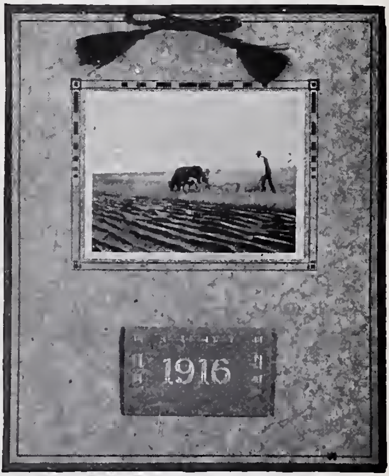
Rochester Optical Division, Rochester, N. Y.

Eastman Kodak Company

HOLIDAY HINTS

Time and Christmas tide wait for no man and the sooner we can get our holiday plans under way, the better for all concerned. Half the fun of Christmas is preparing the gifts—at least it is for us Kodakers with such a wealth of material with which to work. Of course, there must be a few pretentious gifts, but for a good part of our Christmas list, presents having Kodak pictures as a basis are just the thing.

First and foremost is the Kodak album filled with pictures of particular interest to the one we wish to remember. This makes an ideal gift, one that is appreciated much at the outset and even more in the years that follow. What better gift than such an album for members of the family or old friends whom business has called far away from the old town? For your brother out West, for example. Wouldn't he appreciate an album containing pictures of some of the old town landmarks as well as impromptu portraits of the family and snap-shots of scenes and happenings that were once as familiar to him as they now are to you? And for the old friend back East. Wouldn't he just revel in an album of this kind—pictures showing changes that have taken place both in the town and the people he used to know so well? This is the kind of gift that touches the heart and sentiment can hardly be out of place on Christmas day.



Souvenir Calendar

And then there are the calendars. Your Kodak dealer has a complete line of 1916 Souvenir Calendars that a print, carefully selected from your collection, will complete. These calendars are sure to please you and are equally sure to please your friends. They are "craftsman" in design and are even more effective than the calendar lines of previous years. The Souvenir Calendars are equipped with an easel back and are made up in olive marble and brown marble, the former being

especially suitable for black and white and the latter for sepia toned prints. They are manufactured for either horizontal or vertical prints in any of the standard amateur sizes.

A novel feature of the calendar line is the Year Book Calendar. The Year Book Calendar gives plenty of opportunity for original work. It consists of twelve mounts on each of which is a calendar for the current month. At the top of each mount, space has been reserved for a print, and at the left of each calendar pad additional space for an appropriate little word story suggested by the picture. The price of the Year Book Calendar is fifty cents.

You will find that Velox Transparent Water Color Stamps fit in very nicely with your Christmas gift plans. Through the medium of these stamps, the colors that your eye saw as you clicked the shutter may be easily and cleverly reproduced on the print. The colors are self-blending and the veriest novice will experience little difficulty in securing excellent results from the start. A complete outfit of Velox Transparent Water Color Stamps, including book, three brushes, and palette costs seventy-five cents while the booklet of stamps alone costs twenty-five.

THANKSGIVING AND THE KODAK PORTRAIT ATTACHMENT

Above all things, do not neglect to supply yourself with a Kodak Portrait Attachment in readiness for the Thanksgiving home-coming. With the family gathered together from far and near, comes a rare chance for pictures of "the sisters and the cousins and the aunts"—an opportunity that may never again offer itself. And you can only make the most of this opportunity with the Kodak and the Kodak Portrait Attachment.

The Kodak Portrait Attachment is just another lens which brings your Kodak into focus at close range—so close, in fact, that head and shoulder portraits, for example, may be made to occupy a good share of the area of the picture.

On such a day as Thanksgiving, the Kodak Portrait Attachment is worth its weight in gold—and it costs but fifty cents.

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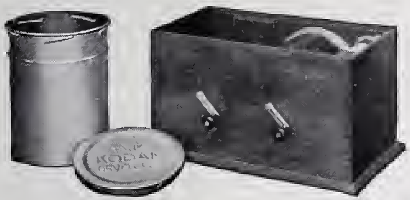

The Kodak Film Tank

has made the darkroom a relic and better negatives the rule. Your dealer will be glad to explain its simple workings.

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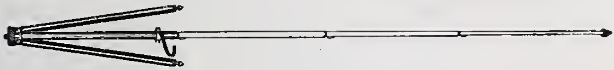


KODAK METAL TRIPOD

It holds the Kodak steady for any length of time exposure—hand exposures longer than 1/25 of a second are out of the question.

The Kodak Metal Tripod is light and compact and the ease with which it may be set up or taken down adds to its convenience. Its rigid construction insures efficiency.

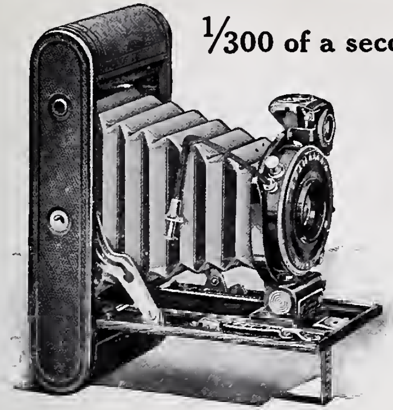
The price ranges from $1.60 to $3.25 according to size. Leather Carrying Case $1.50

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

At your dealer's.

1/300 of a second.



No. 1 Autographic KODAK, *Special*

Small enough to go in the pocket—conveniently.

A shutter with a speed of 1/300 of a second, and of sufficient size to utilize the full working aperture of the lens. And the lens has more than speed, it has quality—and, what is equally important in a small camera, a sufficient length of focus to avoid distortion.

Pictures, 2¼ x 3¼ inches
Price with Zeiss Kodak Anastigmat Lens, *f*.6.3, $45.00

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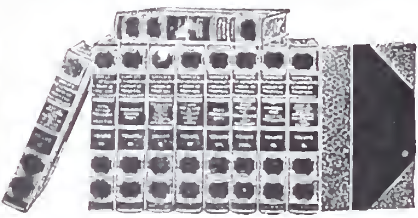

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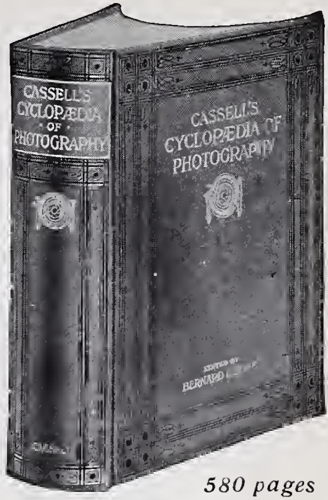

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